ADDENDUM TO THE SECOND FIVE-YEAR REVIEW REPORT
For the
Ralston Site
Cedar Rapids, Linn County, Iowa

December 2013

Prepared by

U.S. Environmental Protection Agency
Region 7
Lenexa, Kansas

Introduction

A Five-Year Review addendum is generally completed for remedies where the protectiveness determination is deferred until further information is obtained. When deferring protectiveness in the Five-Year Review report, the U.S. Environmental Protection Agency typically provides a timeframe for when the information will be obtained and a protectiveness statement can be made. This document describes progress since the June 30, 2011, Second Five-Year Review Report and provides a protectiveness determination for the remedy for the Ralston Site (Site).

The Second Five-Year Review Report for the Site, in Cedar Rapids, Iowa, was signed by Cecilia Tapia, Superfund Division Director on June 30, 2011. The protectiveness statement from the Report was as follows:

- A protectiveness determination for the remedy at the Ralston site cannot be made until further information is obtained. Further information will be obtained by conducting a vapor intrusion study and collecting and evaluating sediment and surface water data from Dry Run Creek. It is expected that this evaluation will take approximately two years to complete, at which time a protectiveness determination may be made.

This Five-Year Review addendum addresses the protectiveness statement for the entire site.

Progress Since the Second Five-Year Review Completion Date

The issues and recommendations from the June 2011 Five-Year Review Report:

Issue	Recommendations and Follow-up Actions	Party Responsible	Milestone Date	Affects Protectiveness (Y/N)	
				Current	Future
1. It is not clearly demonstrated that the extent of contamination has been defined to the east of MW-3B or MW-9B in the Devonian aquifer.	Take actions, possibly including installation of monitoring wells, to define the extent of groundwater contamination to the east in the Devonian aquifer.	Rockwell Collins/ IDNR	6/30/2013	N	Y
2. The vapor intrusion exposure pathway has not been evaluated at the Ralston site.	Evaluate potential for vapor intrusion utilizing multiple lines of evidence.	Rockwell Collins/ IDNR	6/30/2013	*	*
3. The sediments and surface water of Dry Run Creek have not been sampled since prior to the ROD.	Sample sediments and surface water of Dry Run Creek and amend O&M Plan to include periodic sampling.	Rockwell Collins/ IDNR	6/30/2012	*	*

Issue	Recommendations and Follow-up Actions	Party Responsible	Milestone Date	Affects Protectiveness (Y/N)	
4. Listing on the state Registry of Hazardous Waste or Hazardous Substance Disposal Sites is not as enforceable as an environmental covenant.	Implement Uniform Environmental Covenant on the site property.	Rockwell Collins/ IDNR/EPA	6/30/2012	N	Y

*Protectiveness determination deferred.

Actions Taken to Resolve Issues

Issue 1

Two monitoring wells, MW-10B and MW-11B, were installed at the Site between May 14 and 21, 2013. The purpose of the installation of MW-10B and MW-11B was to create groundwater monitoring and sampling points to delineate the extent of groundwater impacts in the Devonian aquifer east of MW-3B and southeast of MW-9, respectively. Monitoring well MW-10B was also located to delineate groundwater impacts in the Devonian aquifer between the Site and the Thurness residence, which would provide information necessary for a vapor intrusion evaluation. (Issue 2) The location of these monitoring wells is shown in Figure 1, attached.

These new monitoring wells, as well as others associated with the Site, were gauged to determine the direction of groundwater flow. It was determined that groundwater flow in the Devonian aquifer was to the east and southeast, as depicted in Figure 2. MW-10B and MW-11B, as well as the other monitoring wells that comprise the monitoring network for the Site, were sampled for volatile organic compounds (VOCs). As summarized in Table 1, VOCs were not detected in MW-10B or MW-11B above a detection limit. The extent of groundwater contamination has been defined to the east of MW-3B or MW-9B in the Devonian aquifer.

Issue 2

In a letter report (attached) dated, February 14, 2012, submitted to the EPA by MWH, on behalf of Rockwell Collins, Inc., the vapor intrusion pathway was evaluated using a multiple-lines-of-evidence approach. However, at that time, the extent of groundwater contamination to the east and southeast in Devonian aquifer was not fully defined. Now that the extent of that groundwater contamination is known, and it has been demonstrated that it does not extend toward buildings in those areas, the conclusions reached in the February 2012 report are acceptable. It can be concluded that outside of the property owned by Rockwell Collins, where future development will not be permitted by the owner, vapor intrusion is unlikely to occur and result in indoor air exceeding a target cancer risk of $1x10^{-6}$ or a noncancer health index greater than one.

Issue 3

Sediment and surface water samples were collected from Dry Run Creek on June 13, 2013. Sampling and analysis of sediment and surface water samples provides information pertaining to the effectiveness of the capping of the disposal area and the stabilization of the bank of Dry Run Creek. Six surface water samples were collected and analyzed for VOCs and metals. VOCs were not detected in any of the surface water samples. Figure 3 shows the surface water sampling locations and the concentration of metals that were detected in the samples. The levels of metals detected in surface water samples were below both chronic and acute ambient water quality criteria for biota and therefore, would not be expected to pose an unacceptable ecological risk.

Sediment samples were collected from four locations in Dry Run Creek and analyzed for VOCs and metals. VOCs were not detected in any of the sediment samples. Figure 4 shows the sediment sampling locations and the metals concentrations that were detected in the samples. The concentrations of the metals that were detected in sediment were compared to MacDonald sediment screening probable effect concentration values and did not exceed these values. Therefore, these metals would not be expected to pose an unacceptable ecological risk.

Issue 4

The property owner, Rockwell Collins, has indicated that they will not implement an environmental covenant at this time. Rockwell's on-going ownership of the Site allows them to control access and limit construction that might result in exposure. They have stated that nothing will be built on the Site. The Site continues to be listed on the state Registry of Hazardous Waste or Hazardous Substance Disposal Sites. The Iowa Chapter 53 Protected Groundwater Use designation within one mile of the Site continues to be in place.

Issues and Recommendations

No new issues or recommendations have been identified since completion of the Second Five-Year Review. Issues 1, 2 and 3 have been fully resolved. The EPA continues to support Recommendation 4- Implementation of a Uniform Environmental Covenant on the site property. A Uniform Environmental Covenant would provide a more permanent and enforceable means of imposing limitations on future use of the property than the current listing on the state registry. Implementing a Uniform Environmental Covenant would ensure long-term protectiveness.

Protectiveness Statement

Based on new information since the Second Five-Year Review completion date, the sitewide protectiveness statement for the Ralston site is being revised as follows:

The remedy at the Ralston site is protective of human health and the environment in the short-term. In order to be protective in the long-term, the EPA will continue to pursue implementation of a Uniform Environmental Covenant on the Rockwell property.

Next Five-Year Review

The next five-year review will be completed by June 30, 2016, five years after the signature of the last five-year review report.

Cecilia Tapia, Director
Superfund Division

Date: 12-13-13

MWH

BUILDING A BETTER WORLD

February 14, 2012

Ms. Diana Engeman, Remedial Project Manager
Iowa/Nebraska Remedial Branch
Superfund Division
U.S. Environmental Protection Agency
901 North 5th Street
Kansas City, KS 66101

MWH #1010763.0101

RE: Second Five-Year Review
Former Ralston Disposal Site
Cedar Rapids, Iowa
EPA ID No. IAD980632491

Dear Ms. Engeman:

MWH, on behalf of our client, Rockwell Collins, Inc. (Rockwell Collins), has prepared this letter to provide a response to the action items outlined in the Second Five-Year Review of the former Ralston Disposal (Ralston) Site, in Cedar Rapids, Iowa (Site), dated June 2011 (5-Year Review), prepared by the United States Environmental Protection Agency (USEPA). In the 5-Year review, the USEPA identified two issues requiring follow-up actions that prohibited USEPA from making a protectiveness determination for the remedy at the Site. Two additional issues were also identified in the 5-Year Review that did not affect the protectiveness determination of the Site remedy; however, the USEPA recommended additional actions be taken. MWH has noted the Iowa Department of Natural Resources (IDNR) does not uniformly share the concerns regarding the issues USEPA raised. Responses to the issues identified are provided in the order, as presented in Table 3 of the 5-Year Review:

1) *It is not clearly demonstrated that the extent of contamination has been defined to the east of MW-3B or MW-9B in the Devonian aquifer.*

The 5-Year Review states this issue does not affect the current protectiveness of the remedy in place. Sections 6.4 and 7.4 of the 5-Year Review have focused on a concern with a change in the apparent groundwater flow direction in the B-series wells monitoring the Devonian bedrock aquifer. It was noted the apparent groundwater flow direction in the Devonian bedrock aquifer has been depicted to be in a more eastern or northeastern direction in the past five years, in comparison to a more southeastern direction as depicted previously. The basis of the comment is groundwater flow directions depicted on groundwater flow direction maps submitted in the Remedial Investigation (RI) Report, and in Annual Remedial Action Activity Reports submitted

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for years 2006 through 2010. The interpreted groundwater flow directions are depicted based on the piezometric surface depicted in these figures, and not based on actual groundwater flow direction calculations.

To evaluate the variation, the groundwater flow direction in the B-series wells monitoring the Devonian bedrock aquifer during the RI and subsequent groundwater gauging events, was compiled. A summary of the gauging data from the B-series monitoring wells is presented in Table 1. Table 1 also includes monitoring well gauging and groundwater elevation data collected in 2011, as part of the planned annual site monitoring activities. The locations of the B-series monitoring wells and other features in the vicinity of the Site are presented in Figure 1. Historical groundwater flow directions were evaluated in monitoring wells MW-1B, MW-3B, and MW-9B; and monitoring wells MW-2B, MW-4B, and MW-9B using gauging data collected since September 1994, following the installation of MW-9B. These two data sets were selected as groundwater between them passes through the Site, as depicted in Figure 1.

Rather than using a typical three point solution (i.e., Heath, 1982) to calculate groundwater flow direction (or azimuth) and hydraulic gradient, a method utilizing vector geometry (Wineland, T. R., K. A. Armstrong, and R. J. Kroneman, 2008) was utilized. For each well set, vector attitudes from one monitoring well to each of two monitoring wells were determined based on the relative location of the wells to each other ("x" and "y" for location) and the respective groundwater elevations ("z"). Cross-product vectors, basically the pole of the piezometric surface of the three wells evaluated, were calculated and converted to a groundwater flow azimuth. This method allows for easy calculation of groundwater flow azimuth in an excel spreadsheet, as presented in Attachment A.

The groundwater flow azimuth calculations were graphed to show the changes in groundwater flow direction and hydraulic gradient as a function of time. Graphs depicting the calculated groundwater flow azimuth for monitoring wells MW-1B, MW-3B and MW-9B, and MW-2B, MW-4B, and MW-9B, respectively are included in Attachment A. As depicted in Graph A-1, the groundwater flow azimuth was calculated to approximately 82 degrees, $\pm$1 degree, or easterly direction over the past five years. This azimuth range mirrors the azimuth range calculated for these monitoring wells using data collected from 1994 through 1996, which was included in the RI. Variation in groundwater flow azimuth of 75 degrees (October 2001 and October 2004) to 95 degrees (October 2002, April 2004, and October 2005) was noted in several of the gauging events completed between 2001 and 2005. The cause of the variability during this period is not clearly evident, but generally coincides with a period when groundwater elevations were generally lower than the past five years.

As depicted in Graph A-2, the groundwater flow azimuth for monitoring well gauging data collected from MW-2B, MW-4B, and MW-9B varied from 119 degrees (southeast) to

262 degrees (west) during the gauging record. Beginning in 2005, the groundwater flow azimuth calculated for these three monitoring wells has been consistently to the south and southeast, but within the azimuth range calculated with the data collected during the RI.

Based on these calculations, a significant shift in groundwater azimuth is not evident at the Site based on the groundwater gauging data, and installation of additional groundwater monitoring points to assess the Devonian bedrock aquifer is not proposed. The extent of groundwater impacts of trichloroethene (TCE) and cis-1,2-dichloroethene (cis-1,2-DCE) east of MW-3B has been delineated in the Devonian bedrock aquifer during the advancement of monitoring well MW-7D, where analysis of groundwater collected through packer sampling was completed at a depth of approximately 63 to 68 feet below ground surface (bgs), as presented in Table 5-3 of the RI.

Groundwater impacts in the Devonian bedrock aquifer southeast of MW-9B have been monitored on a semiannual basis since 2001 through the sampling of the Finley residence well. As summarized in Table 4-7 of the RI, the Finley residence well is open to the Devonian aquifer beginning at an elevation of 815 feet above sea level (ASL), to the base of the Devonian aquifer at approximately 700 feet ASL. The Finley well is open to the interval screened by MW-9B, ranging from approximately 740 to 750 feet ASL. As documented in the RI and subsequent annual reports, detectable concentrations of TCE, cis-1,2-DCE, and other related volatile organic compounds (VOCs) have not been detected in samples collected from the Finley well.

MWH, therefore, concludes further delineation of the groundwater plume in the Devonian bedrock aquifer is not warranted.

2) *The vapor intrusion exposure pathway has not been evaluated at the Ralston site.*

The 5-year Review states this issue needs to be addressed to determine the current protectiveness of the remedy in place. The vapor intrusion pathway was not considered in the original RI or baseline risk assessment. The current concern is VOC-impacted groundwater may underlie or be adjacent to off-site buildings located south of the Site. In the 5-Year Review, the USEPA requested an evaluation of the pathway be completed using a multiple lines of evidence approach.

A desktop evaluation of the vapor intrusion pathway has been completed to assess whether additional action is warranted at the Site. The evaluation used a stepped approach where increasing site-specific data is utilized to evaluate the Site. The evaluation is presented in Attachment B of this letter.

The desktop evaluation concluded that VOC concentrations in the vicinity of MW-1A and MW-3A could potentially result in indoor air concentrations exceeding a target risk of 1E-06, or a hazard index of 1. The highest detected groundwater concentrations and, therefore, calculated maximum soil vapor concentrations are located at MW-3A. The closest residential buildings to MW-3A are the Thurness residence, which is located approximately 570 feet to the northeast, and the Raftis residence located approximately 560 feet to the southwest. Monitoring well MW-1A is also located over 100 feet away from the nearest buildings. However, future residential development in the vicinity of these wells will not occur given Rockwell Collins' ownership of the property in the area, existing institutional controls, the steep topography near the Site, and land development patterns.

The desktop evaluation also concluded VOC concentrations in the vicinity of MW-7D and MW-9B also have the potential to generate indoor air concentrations exceeding a target risk of 1E-06 or a hazard index of 1. Groundwater at MW-9B is over 70 feet below the ground surface, with the glacial till sediments above bedrock at this location approximately 70 feet thick. Shallow groundwater is present in these areas in the surficial sediments, as documented in the RI, and the extent of VOC impacts in the alluvial aquifer have been delineated between the former disposal area and bedrock monitoring well MW-9B. Given the results of groundwater monitoring completed since submittal of the RI, the installation of monitoring wells away from the delineated extent of the VOC impacts in the alluvial aquifer, including the MW-9B location, is not warranted. Given the shallow saturated conditions above bedrock and relatively fine-grained sediments, the alluvial aquifer is expected to be an effective barrier for any vapors potentially generated from impacted groundwater in the bedrock aquifers from impacting any hypothetical future structures that may be installed near MW-9B.

MWH, therefore, concludes further evaluation of the vapor intrusion pathway is not required.

3) *The sediments and surface water of Dry Run Creek have not been sampled since prior to the ROD.*

The 5-Year Review states this issue needs to be addressed to determine the current protectiveness of the remedy in place. USEPA's comments regarding sediment and surface water focus on substantiating that site contaminants of concern (COCs) have not adversely impacted sediment or surface water in Dry Run Creek in the time since collection of the sediment and surface water in 1992 and completion of the Record of Decision (ROD) in 1999, along with completion of the response actions. Four sediment sample locations and five surface water sample locations in Dry Run Creek were sampled in 1992, more than 30 years after disposal activities ceased at the Site and prior to implementation of the remedial activities. Six additional surface water samples were collected in 1994. Analytical results for the sediment and surface water samples in 1992 and 1994 served to characterize potential impact of site COCs

on sediment and surface water in Dry Run Creek. Figure 2 depicts the 1992 sediment locations and 1992 and 1994 surface water sample locations relative to the Remedial Cap Area.

Sediment and surface water data from 1992 were documented in the March 1993 Removal Site Evaluation (1993 RSE), which included an evaluation of the data in relation to USEPA Ambient Water Quality Criteria published in 1980 and 1984. The results of that comparison, as summarized in the 1993 RSE, indicated the 1992 sediment and surface water sample analyte concentrations did not exceed Ambient Water Quality Criteria. Further detail is available in the 1993 RSE. The 1992 sediment and surface data were further evaluated along with soil and groundwater data in the 1994 Final Baseline Risk Assessment (BRA), which addressed human health risk. The findings of the 1994 BRA were summarized in the 1999 ROD indicating the only contaminated media which poses an unacceptable level of threat is groundwater. Six additional surface water samples were collected in 1994 from locations similar to 1992, but with two of the samples located further downstream than the 1992 sample locations, as shown in Figure 2.

To evaluate the 1992 sediment, and 1992 and 1994 surface water data, in relation to more current ecological screening values, the data are presented in Tables 2 and 3 in comparison to the USEPA Region 5 Ecological Screening Levels (ESL) adopted in 2003. The sediment data in Table 2 are also compared to Consensus-Based Probable Effect Concentrations (PECs) (MacDonald, D.D., C.G. Ingersol and T.A. Berger, 2000). The Consensus-Based PECs have historically been used at USEPA direction for evaluation of sediment data at other environmental investigation sites in Iowa.

Among the four sediment samples collected in 1992, three VOCs and ten polynuclear aromatic hydrocarbons (PAHs), were reported above the analytical method detection limits (MDLs). The detected VOCs were acetone, cis-1,2-DCE and TCE. Acetone was detected in one sediment sample at an estimated concentration of 23 micrograms per kilogram (µg/kg), and was also found in the analytical method sample blank. The USEPA Region 5 ESL for sediment for acetone is 9.9 µg/kg. Acetone was reported to be below the MDL in the other three sediment samples. Acetone is a common laboratory artifact, and is not a COC for groundwater at the Site. TCE was detected in one sediment sample at an estimated concentration of 2 µg/kg and was below the MDL in the other three sediment samples. The USEPA Region 5 ESL for TCE is 112 µg/kg. The detected concentrations of cis-1,2-DCE in two sediment samples were 4 µg/kg and 14 µg/kg. There is no established USEPA Region 5 ESL for cis-1,2-DCE. There are no established Consensus-Based PECs for acetone, cis-1,2-DCE, and TCE for comparison.

Eight of the ten PAHs reported in the sediment samples above the MDL were less than the corresponding USEPA Region 5 ESLs for sediment and the Consensus-Based PECs. Two of the PAHs, pyrene, and benzo(a)anthracene, were reported in one sediment sample at

concentrations of 320 µg/kg and 140 µg/kg, respectively. The concentrations of these two PAHs were greater than the applicable USEPA Region 5 ESLs for sediment, but less than the applicable Consensus-Based PECs for pyrene and benzo(a)anthracene. PAHs are not a significant COC for the site, but are common constituents in urban runoff.

Resource Conservation and Recovery Act (RCRA) metals, cyanide, and zinc concentrations in each of the sediment samples were less than the MDL and/or the USEPA Region 5 ESLs for sediment except for cadmium. Cadmium concentrations in all four sediment samples were greater than the USEPA Region 5 ESL for sediment of 990 µg/kg, but less than the Consensus-Based PEC of 4,980 µg/kg.

Surface water samples collected in 1992 were taken during ponded conditions and during flowing conditions within Dry Run Creek. Semivolatile organic compounds (SVOCs) and cyanide were not detected above the MDL in any of the surface water samples. Ten VOCs, barium, cadmium, copper, lead, nickel, and zinc were detected in the surface water samples. All of the detected VOCs were reported at concentrations less than the USEPA Region 5 ESLs for water.

With the exception of cadmium, lead, and copper, the metal constituents detected in the surface water samples were at concentrations less than the USEPA Region 5 ESLs for water. Cadmium was detected in concentrations ranging from less than the method detection limit to 8 µg/L. The USEPA Region 5 ESL for water for cadmium is 0.15 µg/L. Lead concentrations ranged from 2.5 to 6.1 µg/L in the 1992 surface water samples collected during ponded conditions and ranged from 7 to 12.8 µg/L in the surface water samples collected during flowing conditions. The USEPA Region 5 ESL for water for lead is 1.17 µg/L. Surface water samples collected at locations upstream and downstream from the Remedial Cap Area had lead concentrations above the USEPA Region 5 ESLs for water. Lead was also reported as having been detected in the analytical method blank, possibly affecting the reported concentrations in the surface water samples. Copper concentrations ranged from below the MDL of 3 µg/L at the upstream surface water location (PZ-1) to 16.1 µg/L at the location PZ-2 adjacent to the northern reach of the Remedial Cap Area. The USEPA Region 5 ESLs for water for copper is 1.58 µg/L. However, following completion of the RI, metals were determined to no longer be a concern at the Site, and further monitoring unwarranted, based on results of groundwater sampling of A-series wells completed in the Spring of 2001.

The six surface water samples collected in 1994 were analyzed for selected VOCs, cis-1,2-DCE, and TCE. The 1994 surface water data did not exceed the USEPA Region 5 ESL for water for TCE. There is no USEPA Region 5 ESL for water established for cis-1,2-DCE. The concentrations of TCE and cis-1,2-DCE in surface water decreased downstream of the Remedial Cap Area. Evaluation of site COC data from ongoing groundwater monitoring at the

Site (A-series wells, specifically MW-2A, MW-3A and MW-4A) generally shows a stable or gradual reduction of VOCs at the Site.

Corrective measures agreed to in the ROD as protective of surface water and sediment in Dry Run Creek have been implemented. These include the Remedial Cap consisting of the disposal area cap and creek bank stabilization, continuing inspection and maintenance of the cap and bank barriers, and groundwater monitoring. The capping and bank stabilization measures reduced or eliminated the potential for Site COCs to impact sediment and surface water in Dry Run Creek. The inspection and maintenance components of the continuing activities at the Site serve a protective role where Dry Run Creek is concerned, allowing for repairs to the protective systems, as needed, to ensure functionality.

Considering the evaluation of sediment and surface water analytical data already presented in past site reports including as summarized in the 1999 ROD, Rockwell Collins proposes to continue implementation of the Operation and Maintenance (O&M) Plan as currently established. Sediment and surface water sampling of Dry Run Creek was done prior to the Removal Action (RA), and, therefore, was a representation of potential site impacts to the Dry Run Creek under an exposure scenario prior to implementation of the removal actions. The RA as addressed in the ROD, significantly reduced or eliminated any potential threat to aquatic life in Dry Run Creek.

The EPA comments that PCBs and dichloro-diphenyl-trichloroethane (DDT) were not analyzed in sediment samples collected in 1992. Review of the soil sampling data shows that three soil samples SB-1, SB-2, and SB-3 collected in 1992 from the disposal area were analyzed for PCBs and organochlorine pesticides. One Arochlor (Arochlor-1260) was detected once, in the soil sample SB-2 at a concentration of 4.2 milligrams per kilogram (mg/kg). The analyte 4,4-DDT was detected once in soil sample SB-1 at a concentration of 0.4 mg/kg. As depicted in Figure 2, sampling locations SB-1, SB-2, and SB-3 are located beneath the current Remedial Area Cap. The soil samples analyzed for PCBs and pesticides in 1992 were collected as composite samples from the depth interval 0 to 5 feet bgs in the disposal area. The data indicate the presence of Arochlor-1260 and 4,4-DDT was not widespread across the disposal area of the Site and, therefore, were not included in the sediment and surface water sampling events in 1992 and 1994.

Based on the previously conducted evaluation and subsequent activities, no further activities are proposed to address this comment.

4) *Listing on the state Registry of Hazardous Waste or Hazardous Substance Disposal Sites is not enforceable as an environmental covenant.*

The 5-Year Review states this issue does not affect the current protectiveness of the remedy in place. Sections 7.1, 7.3, and 7.4 of the 5-Year Review state a uniform environmental covenant

for the property owned by Rockwell Collins that comprises the Site would be a more enforceable institutional control than the current listing on the state's Registry of Hazardous Waste or Hazardous Substance Disposal Sites (Registry). As further noted in the 5-Year Review, amendments to the Iowa Administrative Code (IAC) covering the Registry state the contaminated portion of a site may be removed from the Registry in the event a uniform environmental covenant is executed for the Site. The July 1, 2011 amendments to the IAC also prohibit new sites from being added to the Registry. The USEPA may have been given the impression during the April 14, 2011 site inspection visit that the Registry was not being maintained. However, the Registry has not been weakened following the July 1, 2011 amendments, and is being maintained for sites that are currently listed.

There are no immediate plans to implement an environmental covenant on the former disposal area property, and the current status of the Registry does not warrant a change in this stance. Rockwell Collins is a viable company that continues to own the property it controls on and surrounding the Site, and there are no plans to change ownership. Development or other change in land use of this property is not planned, and Rockwell Collins understands the need to notify the director of the IDNR for written approval prior to a change in ownership or substantial property use. Furthermore, the current Chapter 53 Protected Groundwater Use designation within 1 mile of the Site continues to be effective to evaluate potential groundwater development near the Site.

No further action is proposed to address the issues raised during the 5-Year review. Furthermore, the presented vapor intrusion evaluation and review of surface water and sediment due not suggest a further delay in issuing a protectiveness determination of the Site is necessary. If you have questions, please feel free to contact Tom Gentner, of Rockwell Collins at 319-295-5710, or me.

Sincerely,

Jeffrey Coon, P.E.
Division Director, E&I West

/srv:vas
Attachments
cc: Tom Gentner, Rockwell Collins
Bob Drustrup, IDNR

REFERENCES

Heath, R.H., 1982. *Basic Ground-Water Hydrology*, United States Geological Survey Water-Supply Paper 2220, p. 81.

Wineland, T. R., K. A. Armstrong and R. J. Kroneman, 2008. *Use of Datalogging Pressure transducers for Enhanced Interpretation of Groundwater Flow, Hydrogeologic Conditions, and Groundwater/Surface Water Interaction – a Case Study of Uses at Former Manufactured Gas Plant Sites.* Presented at the 53rd Annual Midwest Ground Water Conference, Dubuque, Iowa, October 1.

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TABLES

TABLE 1

DEVONIAN AQUIFER GAUGING DATA
FORMER RALSTON DISPOSAL SITE - CEDAR RAPIDS, IOWA

	MW-1B			MW-2B			MW-3B			MW-4B			MW-9B		
Date	TOC	DTW	GWE	TOC	DTW	GWE	TOC	DTW	GWE	TOC	DTW	GWE	TOC	DTW	GWE
12/17/1992	801.10	10.98	790.12	794.57	6.96	787.61	792.30	6.34	785.96	790.03	2.60	787.43	NI	NI	NI
01/05/1993	801.10	11.46	789.64	794.57	7.60	786.97	792.30	7.00	785.30	790.03	3.36	786.67	NI	NI	NI
06/14/1993	801.10	10.05	791.05	794.57	6.98	787.59	792.30	6.22	786.08	790.03	3.33	786.70	NI	NI	NI
12/17/1993	801.10	14.01	787.09	794.57	9.15	785.42	792.30	7.98	784.32	790.03	4.75	785.28	NI	NI	NI
07/06/1994	801.10	12.93	788.17	794.57	8.59	785.98	792.30	7.74	784.56	790.03	4.59	785.44	NI	NI	NI
09/06/1994	805.34	18.78	786.56	794.18	10.04	784.14	791.94	8.56	783.38	789.79	5.50	784.29	855.49	72.64	782.85
12/12/1994	805.34	19.72	785.62	794.18	10.82	783.36	791.94	9.17	782.77	789.79	5.93	783.86	855.49	73.35	782.14
07/10/1995	805.34	17.05	788.29	794.18	8.37	785.81	791.94	7.16	784.78	789.79	4.71	785.08	855.49	71.31	784.18
09/20/1995	805.34	20.34	785.00	794.18	11.86	782.32	791.94	9.58	782.36	789.79	6.71	783.08	855.49	73.40	782.09
12/12/1995	805.34	20.71	784.63	794.18	12.47	781.71	791.94	10.24	781.70	789.79	6.73	783.06	855.49	74.11	781.38
04/08/1996	805.34	20.17	785.17	794.18	12.02	782.16	791.94	9.72	782.22	789.79	6.30	783.49	855.49	73.64	781.85
07/02/1996	805.34	16.39	788.95	794.18	8.03	786.15	791.94	7.19	784.75	789.79	4.18	785.61	855.49	71.46	784.03
09/12/1996	805.34	20.02	785.32	794.18	12.02	782.16	791.94	9.81	782.13	789.79	6.83	782.96	855.49	73.68	781.81
04/25/2001	805.34	14.56	790.78	794.18	7.69	786.49	791.94	6.96	784.98	789.79	3.26	786.53	855.49	71.41	784.08
10/22/2001	805.34	19.73	785.61	794.18	12.01	782.17	791.94	10.66	781.28	789.79	6.04	783.75	855.49	73.68	781.81
04/30/2002	805.34	17.19	788.15	794.18	9.26	784.92	791.94	7.94	784.00	789.79	4.21	785.58	855.49	72.26	783.23
10/22/2002	805.34	18.87	786.47	794.18	10.74	783.44	791.94	8.77	783.17	789.79	5.40	784.39	855.49	73.85	781.64
04/22/2003	805.34	20.67	784.67	794.18	12.95	781.23	791.94	10.53	781.41	789.79	6.20	783.59	855.49	74.53	780.96
10/28/2003	805.34	20.33	785.01	794.18	12.68	781.50	791.94	10.35	781.59	789.79	6.59	783.20	855.49	74.26	781.23
04/07/2004	805.34	16.87	788.47	794.18	8.87	785.31	791.94	7.81	784.13	789.79	4.57	785.22	855.49	74.30	781.19
10/26/2004	805.34	20.24	785.10	794.18	12.52	781.66	791.94	10.23	781.71	789.79	6.49	783.30	855.49	73.13	782.36
04/24/2005	805.34	20.61	784.73	794.18	12.79	781.39	791.94	11.07	780.87	789.79	7.61	782.18	855.49	75.34	780.15
10/25/2005	805.34	21.30	784.04	794.18	14.43	779.75	791.94	11.41	780.53	789.79	8.00	781.79	855.49	78.80	776.69
04/25/2006	805.34	18.02	787.32	794.18	10.18	784.00	791.94	8.77	783.17	789.79	5.17	784.62	855.49	73.13	782.36
04/24/2007	805.34	15.72	789.62	794.18	8.28	785.90	791.94	7.42	784.52	789.79	4.06	785.73	855.49	71.90	783.59
04/01/2008	805.34	12.86	792.48	794.18	6.35	787.83	791.94	5.98	785.96	789.79	2.48	787.31	855.49	70.61	784.88
04/13/2009	805.34	17.00	788.34	794.18	9.29	784.89	791.94	8.00	783.94	789.79	4.52	785.27	855.49	72.37	783.12
05/04/2010	805.34	15.55	789.79	794.18	8.43	785.75	791.94	7.30	784.64	789.79	3.82	785.97	855.49	71.65	783.84
04/25/2011	805.34	16.48	788.86	794.18	8.79	785.39	791.94	7.65	784.29	789.79	3.86	785.93	855.49	72.08	783.41

Notes:
TOC = Top of casing.
DTW = Depth to water.
GWE = Groundwater elevation.
NI = Not installed.

TABLE 2

DRY RUN CREEK SEDIMENT SUMMARY
FORMER RALSTON DISPOSAL SITE - CEDAR RAPIDS, IOWA

Analyte	USEPA Region 5 Ecological Screening Level for Sediment[a] (µg/kg)	Concensus-Based Probable Effect Concentration (PEC)[b] (µg/kg)	Sample Concentration			
			DRC-01-SS-0-6 1992	DRC-02-SS-0-6 1992	DRC-03-SS-0-6 1992	DRC-04-SS-0-6 1992
VOCs (Reported Above MDL						
Acetone	9.9	NE	11 U	12 U	**23** JB	12 U
cis-1,2-Dichloroethene	NE	NE	11 U	4 J	14	12 U
Trichloroethene	112	NE	11 U	2 J	13 U	12 U
SVOCs (Reported Above MDL)						
Phenanthrene	204	1170	38 J	100 J	430 U	160 J
Anthracene	57.2	845	350 U	390 U	430 U	40 J
Fluoranthene	423	2230	77 J	190 J	430 U	340 J
Pyrene	195	1520	66 J	190 J	430 U	**320** J
Benzo(a)Anthracene	108	1050	350 U	59 R	430 U	**140** J
Chrysene	166	1290	37 J	94 R	430 U	130 J
Benzo(b)Fluoranthene	10,400	NE	40 J	100 J	430 U	140 J
Benzo(k)Fluoranthene	240	NE	350 U	57 J	430 U	84 J
Benzo(a)Pyrene	150	1450	350 U	69 J	430 U	120 J
Indeno(1,2,3-cd)Pyrene	200	NE	350 U	390 U	430 U	44 J
Metals						
Arsenic	9790	33,000	1400 B	1500 B	1100 B	1400 B
Barium	NE	NE	26,200 B	77,900	18,400 B	60,400
Cadmium	990	4980	**1400**	**1800**	**1400**	**2000**
Chromium	43,400	111,000	3300	5300	3200	5000
Copper	31,600	149,000	2200 B	5100 B	2000 B	2700 B
Lead	35,800	128,000	4800 J	17,100 J	3700 J	7500 J
Nickel	22,700	48,600	5000 B	5100 B	3200 B	4800 B
Silver	500	NE	640 U	710 U	740 U	700 U
Zinc	121,000	459,000	16,100 JB	20,900	14,400 JB	16,200 JB
Cyanide	0.1	NE	530 U	590 U	620 U	590 U

Notes:

All results are in micrograms per kilogram (µg/kg).

Analyte concentrations above the USEPA Region 5 Ecological Screening Level for Sediment are shown in bold text.

The analytical data summarized above are referenced from the March 1993 Removal Site Evaluation.

[a] United States Environmental Protection Agency (USEPA) Resource Conservation and Recovery Act (RCRA) Ecological Screening Levels (August 22, 2003)

[b] Concensus-based Probable Effect Concentration (PEC) for sediment in freshwater ecosystems are referenced from MacDonald, D.D., C.G. Ingersol and T.A. Berger, 2000. Development and Evaluation of Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems. Archives of Environmental Contamination and Toxicology 39:20-31.

NE = Not established.

VOCs = Volatile organic compounds.

SVOCs = Semivolatile organic compounds.

Data Qualifiers

B Indicates analyte detected in associated blank as well as in the sample.

J Indicates an estimated value.

U Indicates analyte was analyzed for but not detected at given detection limits.

R Indicates data rejected due to quality control criteria.

UJ Indicates approximate detection limit due to quality control criteria.

TABLE 3

SURFACE WATER DATA SUMMARY
FORMER RALSTON DISPOSAL SITE - CEDAR RAPIDS, IOWA

Analyte	USEPA Region 5 Ecological Screening Levels for Water (µg/L)[e]	Sample Identification													
		DRC-03-SW-1[a] 1992	DRC-03-SW-1[a,d] 1992	DRC-04-SW-1[a] 1992	DRC-05-SW-1[a,c] 1992	DRC-01-SW-1A[b] 1992	DRC-02-SW-1A[b] 1992	DRC-03-SW-1A[b] 1992	DRC-04-SW-1A[b] 1992	PZ-3A[f] 1993	PZ-4A[f] 1993	PZ-6A[f] 1993	PZ-7[f] 1993	PZ-4-SW[f] 1993	PZ-7-SW[f] 1993
VOCs (Reported Above MDL)															
Vinyl Chloride	930	20	9 J	3	3	2 U	2 U	8	5	NA	NA	NA	NA	NA	NA
Acetone	1700	2 U	22 JB	3	3	7 JB	2 JB	6 JB	7 JB	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	65	0.4 J	10 UJ	2 UJ	2 UJ	2 UJ	2 UJ	2 JB	2 UJ	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	NE	92	68 J	8 JB	7 JB	2 U	0.3 J	29 J	22	11,175	265	10.9	4.4	9.4	12.1
trans-1,2-Dichloroethene	970	0.9 J	10 UJ	2 U	2 U	2 UJ	2 U	2 UJ	2 U	NA	NA	NA	NA	NA	NA
1,1,1-Trichloroethane	76	0.3 J	10 U	2 U	2 U	2 U	2 U	2 U	2 U	NA	NA	NA	NA	NA	NA
Trichloroethene	47	7 JB	10 U	1 J	1 J	2 U	2 U	2 U	2	13.3	24.2	1.0	ND[g]	ND	ND
Tetrachloroethene	45	0.7 J	10 U	2 U	2 U	2 U	2 U	2 U	0.4 J	NA	NA	NA	NA	NA	NA
Toluene	253	2 U	10 U	2 U	2 U	2 U	2 U	2 U	0.9 J	NA	NA	NA	NA	NA	NA
Total Xylenes	27	2 U	10 U	2 U	2 U	2 UJ	2 U	2 U	0.3 J	NA	NA	NA	NA	NA	NA
Metals															
Arsenic	148	3 U	NA	3 U	3 U	3 U	3 U	3 U	3 U	NA	NA	NA	NA	NA	NA
Barium	220	195 B	NA	142	141 B	35.4 B	43.6 JB	42.8 JB	62 JB	NA	NA	NA	NA	NA	NA
Cadmium	0.15	**8**	NA	**3.1**	3 U	3 U	3 U	3 U	3 U	NA	NA	NA	NA	NA	NA
Chromium	42	3 U	NA	3 U	3 U	3 U	3 U	3 U	3 U	NA	NA	NA	NA	NA	NA
Copper	1.58	**12.9**	NA	**13.4**	**11.6**	3 U	**16.1**	**10.2**	**13**	NA	NA	NA	NA	NA	NA
Lead	1.17	**2.4** JB	NA	**5.2** JB	**6.1** JB	**7** JB	**7** JB	**12.8** JB	**10** JB	NA	NA	NA	NA	NA	NA
Nickel	28.9	6.8 JB	NA	8.1 JB	6 U	6 U	6 U	6 U	6 U	NA	NA	NA	NA	NA	NA
Silver	0.12	3 U	NA	3 U	3 U	3 U	3 U	3 U	3 U	NA	NA	NA	NA	NA	NA
Zinc	65.7	39.8 JB	NA	64.2 JB	26.1 JB	42.1 JB	38.1 JB	34.6 JB	48 JB	NA	NA	NA	NA	NA	NA
Cyanide	5.2	NA	NA	NA	NA	10 U	10 U	10 U	10 U	NA	NA	NA	NA	NA	NA

TABLE 3

SURFACE WATER DATA SUMMARY
FORMER RALSTON DISPOSAL SITE - CEDAR RAPIDS, IOWA

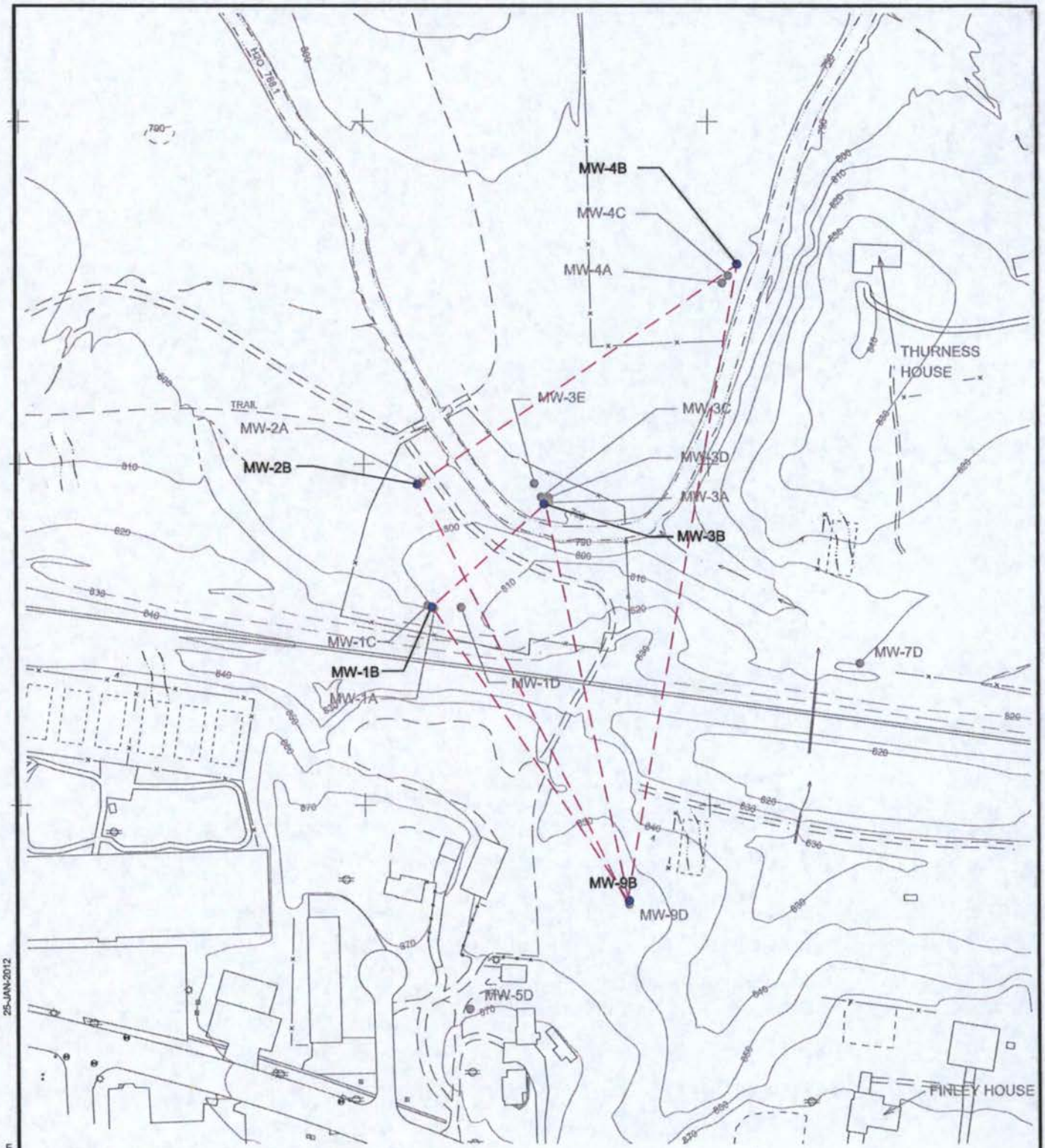
Notes:

All results are in microgram(s) per liter (µg/L).
Analytical results that exceed the USEPA Region 5 Ecological Screening Levels for Water are shown in bold text.
Analytical results summarized above are referenced from the March 1993 Removal Site Evaluation and the February 4, 1994 Phase 3 Project Update Memorandum.
[a] Indicates collected under ponded conditions.
[b] Indicates collected under flowing conditions.
[c] Indicates sample is a duplicate of DRC-04-SW-1.
[d] Indicates sample diluted and reanalyzed due to high concentrations.
[e] United States Environmental Protection Agency (USEPA) Resource Conservation and Recovery Act (RCRA) Ecological
[f] Sample analyzed with Rockwell International Corporation gas chromatograph.
[g] Analytical data is listed as ND (not detected) as referenced in the February 4, 1994 report *Phase 3 Project Update Memorandum.*
NA Not analyzed.
VOCs = Volatile organic compounds.

Data Qualifiers

J Indicates an estimated value.
JB Indicates approximate data due to blank contamination.
U Indicates analyte was analyzed for but not detected at given detection limits.
UJ Indicates approximate detection limit due to quality control criteria.

FIGURES



DESIGNED BY	-	
DRAWN BY	NORA DAY	
CHECKED BY	MIKE ALOWITZ	
APPROVED BY	-	
PROJECT MANAGER	STEVE VARSA	
CLIENT APPROVAL	-	
CLIENT REFERENCE NO.	-	

PROJECT LOCATION: DES MOINES, IOWA

PROJECT: ROCKWELL COLLINS, INC
CEDAR RAPIDS, IOWA

TITLE: DEVONIAN AQUIFER (B WELLS)

MWH

FIGURE 1

REVISION -

FILE NAME -

25-JAN-2012

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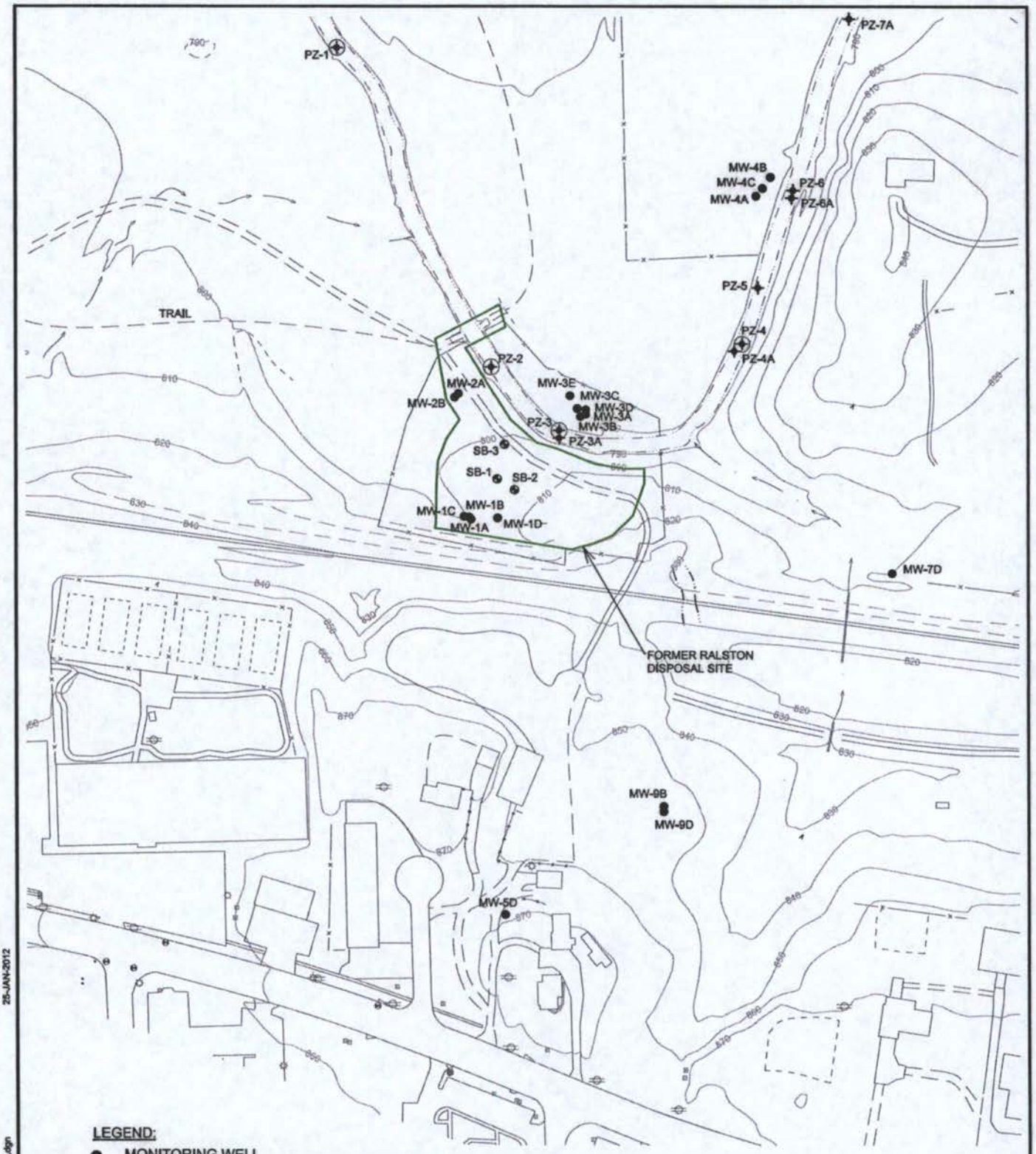

25-JAN-2012

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DESIGNED BY	-	
	NORA DAY	
CHECKED BY	MIKE ALOWITZ	
APPROVED BY	-	
PROJECT MANAGER	STEVE VARSA	
CLIENT APPROVAL	-	
CLIENT REFERENCE NO.	-	

0 100 200
SCALE IN FEET

PROJECT LOCATION: DES MOINES, IOWA
PROJECT: ROCKWELL COLLINS, INC
CEDAR RAPIDS, IOWA

TITLE: SELECTED SAMPLING LOCATIONS

MWH

FIGURE 2
REVISION -
FILE NAME -

ATTACHMENT A

MWH

Devonian Aquifer Gauging Data
Former Ralston Disposal Site - Cedar Rapids
Azimuth and Gradient Calculations: MW-1B/MW-3B/MW-9B

TOC	805.34			791.94			855.49			Notes
	MW-1B			MW-3B			MW-9B			
Date	TOC	DTW	GWE	TOC	DTW	GWE	TOC	DTW	GWE	
12/17/1992	801.10	10.98	790.12	792.30	6.34	785.96	NE	NE	NE	MW-9B not installed
01/05/1993	801.10	11.46	789.64	792.30	7.00	785.30	NE	NE	NE	MW-9B not installed
06/14/1993	801.10	10.05	791.05	792.30	6.22	786.08	NE	NE	NE	MW-9B not installed
12/17/1993	801.10	14.01	787.09	792.30	7.98	784.32	NE	NE	NE	MW-9B not installed
07/06/1994	801.10	12.93	788.17	792.30	7.74	784.56	NE	NE	NE	MW-9B not installed
09/06/1994	805.34	18.78	786.56	791.94	8.56	783.38	855.49	72.64	782.85	
12/12/1994	805.34	19.72	785.62	791.94	9.17	782.77	855.49	73.35	782.14	
07/10/1995	805.34	17.05	788.29	791.94	7.16	784.78	855.49	71.31	784.18	
09/20/1995	805.34	20.34	785.00	791.94	9.58	782.36	855.49	73.40	782.09	
12/12/1995	805.34	20.71	784.63	791.94	10.24	781.7	855.49	74.11	781.38	
04/08/1996	805.34	20.17	785.17	791.94	9.72	782.22	855.49	73.64	781.85	
07/02/1996	805.34	16.39	788.95	791.94	7.19	784.75	855.49	71.46	784.03	
09/12/1996	805.34	20.02	785.32	791.94	9.81	782.13	855.49	73.68	781.81	
04/25/2001	805.34	14.56	790.78	791.94	6.96	784.98	855.49	71.41	784.08	
10/22/2001	805.34	19.73	785.61	791.94	10.66	781.28	855.49	73.68	781.81	
04/30/2002	805.34	17.19	788.15	791.94	7.94	784.00	855.49	72.26	783.23	
10/22/2002	805.34	18.87	786.47	791.94	8.77	783.17	855.49	73.85	781.64	
04/22/2003	805.34	20.67	784.67	791.94	10.53	781.41	855.49	74.53	780.96	
10/28/2003	805.34	20.33	785.01	791.94	10.35	781.59	855.49	74.26	781.23	
04/07/2004	805.34	16.87	788.47	791.94	7.81	784.13	855.49	74.30	781.19	
10/26/2004	805.34	20.24	785.10	791.94	10.23	781.71	855.49	73.13	782.36	
04/24/2005	805.34	20.61	784.73	791.94	11.07	780.87	855.49	75.34	780.15	
10/25/2005	805.34	21.30	784.04	791.94	11.41	780.53	855.49	78.80	776.69	
04/25/2006	805.34	18.02	787.32	791.94	8.77	783.17	855.49	73.13	782.36	
04/24/2007	805.34	15.72	789.62	791.94	7.42	784.52	855.49	71.90	783.59	
04/01/2008	805.34	12.86	792.48	791.94	5.98	785.96	855.49	70.61	784.88	
04/13/2009	805.34	17.00	788.34	791.94	8.00	783.94	855.49	72.37	783.12	
05/04/2010	805.34	15.55	789.79	791.94	7.30	784.64	855.49	71.65	783.84	
04/25/2011	805.34	16.48	788.86	791.94	7.65	784.29	855.49	72.08	783.41	

Horizontal Gradient:
Azimuth (relative Distance (relative to A)

Point A (MW-1B)	---	---
Point B (MW-3B)	48.1	222.2
Point C (MW-9B)	147.2	512.6

Date	elevation A	elevation B	elevation C	inclination B	inclination C	Azimuth 1	Plunge 1	Azimuth 2	Plunge 2	App. dip 1 Cos(alpha)
12/17/1992	790.120	785.960	NE	1.073	#VALUE!	48.130	1.073	147.200	#VALUE!	0.745
01/05/1993	789.640	785.300	NE	1.119	#VALUE!	48.130	1.119	147.200	#VALUE!	0.745
06/14/1993	791.050	786.080	NE	1.281	#VALUE!	48.130	1.281	147.200	#VALUE!	0.744
12/17/1993	787.090	784.320	NE	0.714	#VALUE!	48.130	0.714	147.200	#VALUE!	0.745
07/06/1994	788.170	784.560	NE	0.931	#VALUE!	48.130	0.931	147.200	#VALUE!	0.745
09/06/1994	786.560	783.380	782.850	0.820	0.415	48.130	0.820	147.200	0.415	0.745
12/12/1994	785.620	782.770	782.140	0.735	0.389	48.130	0.735	147.200	0.389	0.745
07/10/1995	788.290	784.780	784.180	0.905	0.459	48.130	0.905	147.200	0.459	0.745
09/20/1995	785.000	782.360	782.090	0.681	0.325	48.130	0.681	147.200	0.325	0.745
12/12/1995	784.630	781.700	781.380	0.755	0.363	48.130	0.755	147.200	0.363	0.745
04/08/1996	785.170	782.220	781.850	0.761	0.371	48.130	0.761	147.200	0.371	0.745
07/02/1996	788.950	784.750	784.030	1.083	0.550	48.130	1.083	147.200	0.550	0.745
09/12/1996	785.320	782.130	781.810	0.823	0.392	48.130	0.823	147.200	0.392	0.745
04/25/2001	790.780	784.980	784.080	1.495	0.749	48.130	1.495	147.200	0.749	0.744
10/22/2001	785.610	781.280	781.810	1.116	0.425	48.130	1.116	147.200	0.425	0.745
04/30/2002	788.150	784.000	783.230	1.070	0.550	48.130	1.070	147.200	0.550	0.745
10/22/2002	786.470	783.170	781.640	0.851	0.540	48.130	0.851	147.200	0.540	0.745
04/22/2003	784.670	781.410	780.960	0.841	0.415	48.130	0.841	147.200	0.415	0.745
10/28/2003	785.010	781.590	781.230	0.882	0.423	48.130	0.882	147.200	0.423	0.745
04/07/2004	788.470	784.130	781.190	1.119	0.814	48.130	1.119	147.200	0.814	0.745
10/26/2004	785.100	781.710	782.360	0.874	0.306	48.130	0.874	147.200	0.306	0.745
04/24/2005	784.730	780.870	780.150	0.995	0.512	48.130	0.995	147.200	0.512	0.745
10/25/2005	784.040	780.530	776.690	0.905	0.821	48.130	0.905	147.200	0.821	0.745
04/25/2006	787.320	783.170	782.360	1.070	0.554	48.130	1.070	147.200	0.554	0.745
04/24/2007	789.620	784.520	783.590	1.315	0.674	48.130	1.315	147.200	0.674	0.744
04/01/2008	792.480	785.960	784.880	1.681	0.849	48.130	1.681	147.200	0.849	0.744
04/13/2009	788.340	783.940	783.120	1.134	0.583	48.130	1.134	147.200	0.583	0.745
05/04/2010	789.790	784.640	783.840	1.328	0.665	48.130	1.328	147.200	0.665	0.744
04/25/2011	788.860	784.290	783.410	1.178	0.609	48.130	1.178	147.200	0.609	0.745

Devonian Aquifer Gauging Data
Former Ralston Disposal Site - Cedar Rapids
Azimuth and Gradient Calculations: MW-1B/MW-3B/MW-9B

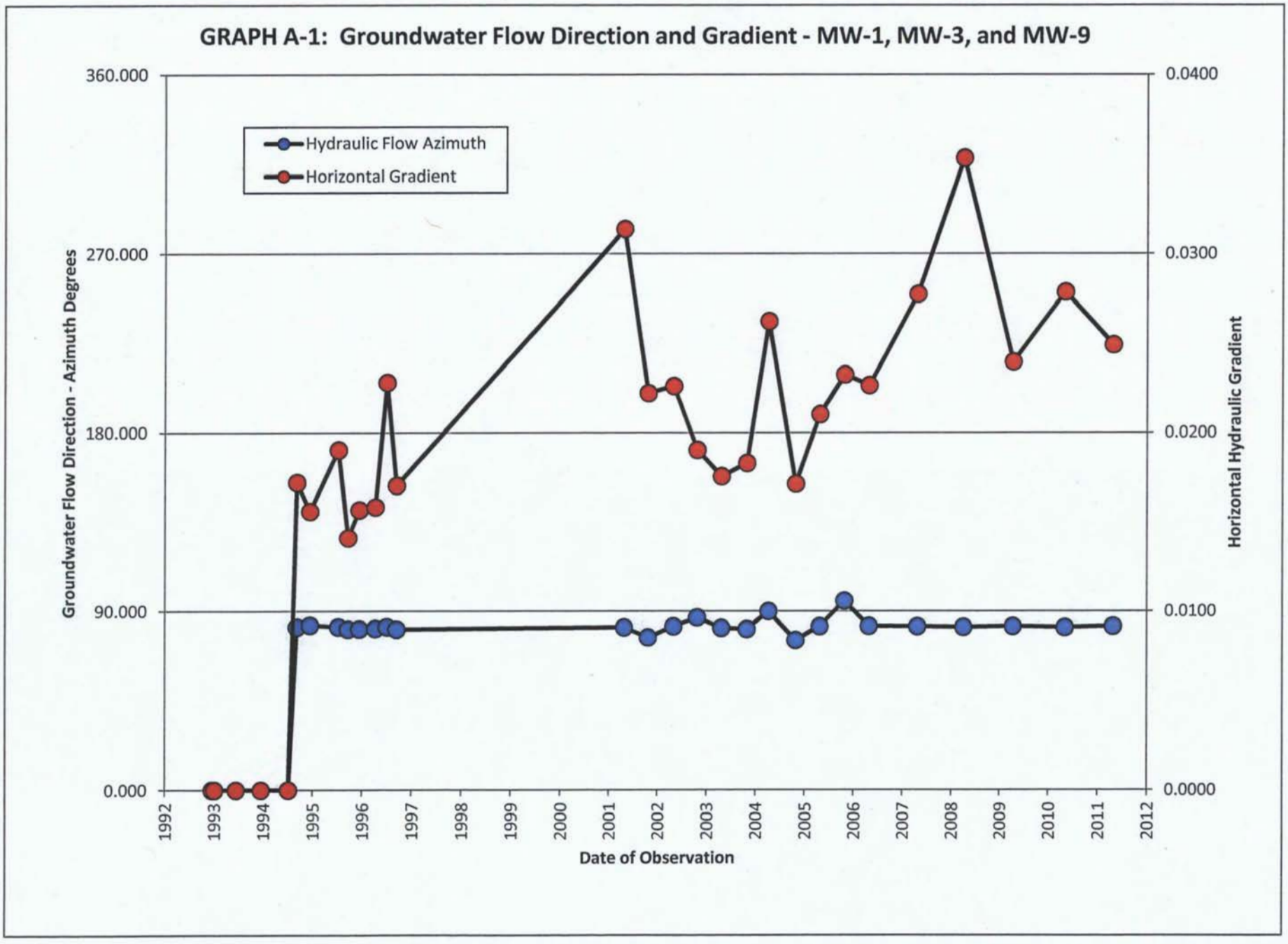
		App. dip 2			Theta	Lower Hemisphere	Cross-product			Pole	Pole	Strike of	True		Hydraulic Flow Azimuth	Horizontal Gradient	Horizontal Gradient
Cos(beta)	Cos(gamma)	Cos(alpha)	Cos(beta)	Cos(gamma)	Angle(radians)	Flag	Cos(alpha)	Cos(beta)	Cos(gamma)	Azimuth	Plunge	Plane	Dip	Strike & Dip	degrees	m/km	m/m
0.667	0.019	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	N 58.47 W	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
0.667	0.020	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	N 58.47 W	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
0.667	0.022	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	N 58.47 W	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
0.667	0.012	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	N 58.47 W	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
0.667	0.016	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	N 58.47 W	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
0.667	0.014	0.542	-0.841	0.007	1.729	-1.000	-0.017	-0.002	1.000	262.022	89.01	N 58.47 W	0.99 NE	N 58.47 W 0.99 NE	82.022	17.241	0.0172
0.667	0.013	0.542	-0.841	0.007	1.729	-1.000	-0.016	-0.002	1.000	262.954	89.10	N 58.47 W	0.90 NE	N 58.47 W 0.90 NE	82.954	15.624	0.0156
0.667	0.016	0.542	-0.841	0.008	1.729	-1.000	-0.019	-0.003	1.000	262.096	88.91	N 58.47 W	1.09 NE	N 58.47 W 1.09 NE	82.096	19.046	0.0190
0.667	0.012	0.542	-0.841	0.006	1.729	-1.000	-0.014	-0.002	1.000	260.891	89.19	N 58.47 W	0.81 NE	N 58.47 W 0.81 NE	80.891	14.129	0.0141
0.667	0.013	0.542	-0.841	0.006	1.729	-1.000	-0.016	-0.002	1.000	261.014	89.10	N 58.47 W	0.90 NE	N 58.47 W 0.90 NE	81.014	15.702	0.0157
0.667	0.013	0.542	-0.841	0.006	1.729	-1.000	-0.016	-0.002	1.000	261.301	89.09	N 58.47 W	0.91 NE	N 58.47 W 0.91 NE	81.301	15.861	0.0159
0.667	0.019	0.542	-0.841	0.010	1.729	-1.000	-0.023	-0.003	1.000	262.104	88.69	N 58.47 W	1.31 NE	N 58.47 W 1.31 NE	82.104	22.793	0.0228
0.667	0.014	0.542	-0.841	0.007	1.729	-1.000	-0.017	-0.003	1.000	260.856	89.02	N 58.47 W	0.98 NE	N 58.47 W 0.98 NE	80.856	17.065	0.0171
0.667	0.026	0.542	-0.840	0.013	1.729	-1.000	-0.031	-0.004	1.000	261.822	88.20	N 58.47 W	1.80 NE	N 58.47 W 1.80 NE	81.822	31.372	0.0314
0.667	0.019	0.542	-0.841	0.007	1.729	-1.000	-0.022	-0.005	1.000	256.715	88.73	N 58.47 W	1.27 NE	N 58.47 W 1.27 NE	76.715	22.192	0.0222
0.667	0.019	0.542	-0.841	0.010	1.729	-1.000	-0.022	-0.003	1.000	262.348	88.71	N 58.47 W	1.29 NE	N 58.47 W 1.29 NE	82.348	22.586	0.0226
0.667	0.015	0.542	-0.841	0.009	1.729	-1.000	-0.019	-0.001	1.000	266.864	88.91	N 58.47 W	1.09 NE	N 58.47 W 1.09 NE	86.864	19.039	0.0190
0.667	0.015	0.542	-0.841	0.007	1.729	-1.000	-0.017	-0.003	1.000	261.523	88.99	N 58.47 W	1.01 NE	N 58.47 W 1.01 NE	81.523	17.572	0.0176
0.667	0.015	0.542	-0.841	0.007	1.729	-1.000	-0.018	-0.003	1.000	260.944	88.95	N 58.47 W	1.05 NE	N 58.47 W 1.05 NE	80.944	18.314	0.0183
0.667	0.020	0.542	-0.840	0.014	1.729	-1.000	-0.026	0.000	1.000	269.989	88.50	N 58.47 W	1.50 NE	N 58.47 W 1.50 NE	89.989	26.225	0.0262
0.667	0.015	0.542	-0.841	0.005	1.729	-1.000	-0.017	-0.004	1.000	255.353	89.02	N 58.47 W	0.98 NE	N 58.47 W 0.98 NE	75.353	17.157	0.0172
0.667	0.017	0.542	-0.841	0.009	1.729	-1.000	-0.021	-0.003	1.000	262.365	88.80	N 58.47 W	1.20 NE	N 58.47 W 1.20 NE	82.365	21.012	0.0210
0.667	0.016	0.542	-0.840	0.014	1.729	-1.000	-0.023	0.002	1.000	275.302	88.67	N 58.47 W	1.33 SE	N 58.47 W 1.33 SE	95.302	23.237	0.0232
0.667	0.019	0.542	-0.841	0.010	1.729	-1.000	-0.022	-0.003	1.000	262.513	88.70	N 58.47 W	1.30 NE	N 58.47 W 1.30 NE	82.513	22.631	0.0226
0.667	0.023	0.542	-0.841	0.012	1.729	-1.000	-0.027	-0.004	1.000	262.293	88.41	N 58.47 W	1.59 NE	N 58.47 W 1.59 NE	82.293	27.739	0.0277
0.667	0.029	0.542	-0.840	0.015	1.729	-0.999	-0.035	-0.005	0.999	262.004	87.98	N 58.47 W	2.02 NE	N 58.47 W 2.02 NE	82.004	35.342	0.0353
0.667	0.020	0.542	-0.841	0.010	1.729	-1.000	-0.024	-0.003	1.000	262.362	88.63	N 58.47 W	1.37 NE	N 58.47 W 1.37 NE	82.362	23.951	0.0240
0.667	0.023	0.542	-0.841	0.012	1.729	-1.000	-0.028	-0.004	1.000	261.825	88.40	N 58.47 W	1.60 NE	N 58.47 W 1.60 NE	81.825	27.857	0.0279
0.667	0.021	0.542	-0.841	0.011	1.729	-1.000	-0.025	-0.003	1.000	262.468	88.57	N 58.47 W	1.43 NE	N 58.47 W 1.43 NE	82.468	24.908	0.0249

Devonian Aquifer Gauging Data
Former Ralston Disposal Site - Cedar Rapids
Azimuth and Gradient Calculations: MW-2B/MW-4B/MW-9B

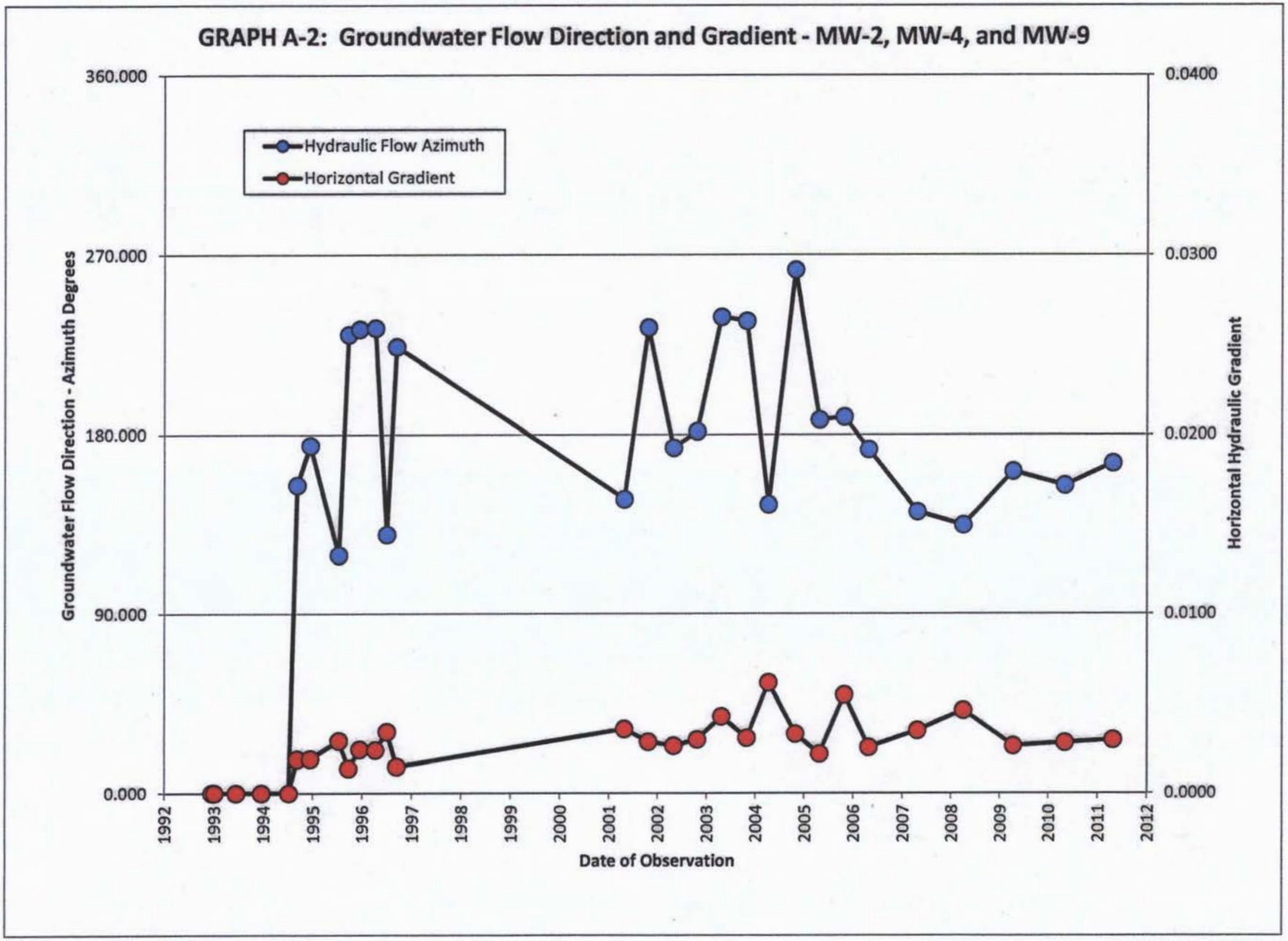
TOC		794.18			789.79			855.49				Horizontal Gradient: Azimuth (relative	Distance (relative to A)								
		MW-2B			MW-4B			MW-9B				Point A (MW-2B)	---	---							
												Point B (MW-4B)	56.4	553.0							
												Point C (MW-9B)	154.2	678.8							App. dip f
	TOC	DTW	GWE	TOC	DTW	GWE	TOC	DTW	GWE			elevation A	elevation B	elevation C	inclination B	inclination C	Azimuth 1	Plunge 1	Azimuth 2	Plunge 2	Cos(alpha)
12/17/1992	794.57	6.96	787.61	790.03	2.60	787.43	NE	NE	NE	MW-9B not installed		787.610	787.430	NE	0.019	#VALUE!	56.400	0.019	154.200	#VALUE!	0.833
01/05/1993	794.57	7.60	786.97	790.03	3.36	786.67	NE	NE	NE	MW-9B not installed		786.970	786.670	NE	0.031	#VALUE!	56.400	0.031	154.200	#VALUE!	0.833
06/14/1993	794.57	6.98	787.59	790.03	3.33	786.70	NE	NE	NE	MW-9B not installed		787.590	786.700	NE	0.092	#VALUE!	56.400	0.092	154.200	#VALUE!	0.833
12/17/1993	794.57	9.15	785.42	790.03	4.75	785.28	NE	NE	NE	MW-9B not installed		785.420	785.280	NE	0.015	#VALUE!	56.400	0.015	154.200	#VALUE!	0.833
07/06/1994	794.57	8.59	785.98	790.03	4.59	785.44	NE	NE	NE	MW-9B not installed		785.980	785.440	NE	0.056	#VALUE!	56.400	0.056	154.200	#VALUE!	0.833
09/06/1994	794.18	10.04	784.14	789.79	5.50	784.29	855.49	72.64	782.85			784.140	784.290	782.850	-0.016	0.109	56.400	-0.016	154.200	0.109	0.833
12/12/1994	794.18	10.82	783.36	789.79	5.93	783.86	855.49	73.35	782.14			783.360	783.860	782.140	-0.052	0.103	56.400	-0.052	154.200	0.103	0.833
07/10/1995	794.18	8.37	785.81	789.79	4.71	785.08	855.49	71.31	784.18			785.810	785.080	784.180	0.076	0.138	56.400	0.076	154.200	0.138	0.833
09/20/1995	794.18	11.86	782.32	789.79	6.71	783.08	855.49	73.40	782.09			782.320	783.080	782.090	-0.079	0.019	56.400	-0.079	154.200	0.019	0.833
12/12/1995	794.18	12.47	781.71	789.79	6.73	783.06	855.49	74.11	781.38			781.710	783.060	781.380	-0.140	0.028	56.400	-0.140	154.200	0.028	0.833
04/08/1996	794.18	12.02	782.16	789.79	6.30	783.49	855.49	73.64	781.85			782.160	783.490	781.850	-0.138	0.026	56.400	-0.138	154.200	0.026	0.833
07/02/1996	794.18	8.03	786.15	789.79	4.18	785.61	855.49	71.46	784.03			786.150	785.610	784.030	0.056	0.179	56.400	0.056	154.200	0.179	0.833
09/12/1996	794.18	12.02	782.16	789.79	6.83	782.96	855.49	73.68	781.81			782.160	782.960	781.810	-0.083	0.030	56.400	-0.083	154.200	0.030	0.833
04/25/2001	794.18	7.69	786.49	789.79	3.26	786.53	855.49	71.41	784.08			786.490	786.530	784.080	-0.004	0.203	56.400	-0.004	154.200	0.203	0.833
10/22/2001	794.18	12.01	782.17	789.79	6.04	783.75	855.49	73.68	781.81			782.170	783.750	781.810	-0.164	0.030	56.400	-0.164	154.200	0.030	0.833
04/30/2002	794.18	9.26	784.92	789.79	4.21	785.58	855.49	72.26	783.23			784.920	785.580	783.230	-0.068	0.143	56.400	-0.068	154.200	0.143	0.833
10/22/2002	794.18	10.74	783.44	789.79	5.40	784.39	855.49	73.85	781.64			783.440	784.390	781.640	-0.098	0.152	56.400	-0.098	154.200	0.152	0.833
04/22/2003	794.18	12.95	781.23	789.79	6.20	783.59	855.49	74.53	780.96			781.230	783.590	780.960	-0.245	0.023	56.400	-0.245	154.200	0.023	0.833
10/28/2003	794.18	12.68	781.5	789.79	6.59	783.2	855.49	74.26	781.23			781.500	783.200	781.230	-0.176	0.023	56.400	-0.176	154.200	0.023	0.833
04/07/2004	794.18	8.87	785.31	789.79	4.57	785.22	855.49	74.30	781.19			785.310	785.220	781.190	0.009	0.348	56.400	0.009	154.200	0.348	0.833
10/26/2004	794.18	12.52	781.66	789.79	6.49	783.30	855.49	73.13	782.36			781.660	783.300	782.360	-0.170	-0.059	56.400	-0.170	154.200	-0.059	0.833
04/24/2005	794.18	12.79	781.39	789.79	7.61	782.18	855.49	75.34	780.15			781.390	782.180	780.150	-0.082	0.105	56.400	-0.082	154.200	0.105	0.833
10/25/2005	794.18	14.43	779.75	789.79	8.00	781.79	855.49	78.80	776.69			779.750	781.790	776.690	-0.211	0.258	56.400	-0.211	154.200	0.258	0.833
04/25/2006	794.18	10.18	784.00	789.79	5.17	784.62	855.49	73.13	782.36			784.000	784.620	782.360	-0.064	0.138	56.400	-0.064	154.200	0.138	0.833
04/24/2007	794.18	8.28	785.90	789.79	4.06	785.73	855.49	71.90	783.59			785.900	785.730	783.590	0.018	0.195	56.400	0.018	154.200	0.195	0.833
04/01/2008	794.18	6.35	787.83	789.79	2.48	787.31	855.49	70.61	784.88			787.830	787.310	784.880	0.054	0.249	56.400	0.054	154.200	0.249	0.833
04/13/2009	794.18	9.29	784.89	789.79	4.52	785.27	855.49	72.37	783.12			784.890	785.270	783.120	-0.039	0.149	56.400	-0.039	154.200	0.149	0.833
05/04/2010	794.18	8.43	785.75	789.79	3.82	785.97	855.49	71.65	783.84			785.750	785.970	783.840	-0.023	0.161	56.400	-0.023	154.200	0.161	0.833
04/25/2011	794.18	8.79	785.39	789.79	3.86	785.93	855.49	72.08	783.41			785.390	785.930	783.410	-0.056	0.167	56.400	-0.056	154.200	0.167	0.833

Devonian Aquifer Gauging Data
Former Ralston Disposal Site - Cedar Rapids
Azimuth and Gradient Calculations: MW-2B/MW-4B/MW-9B

		App. dip 2			Theta	Lower Hemisphere	Cross-product			Pole	Pole	Strike of	True		Hydraulic Flow Azimuth	Horizontal Gradient	Horizontal Gradient
Cos(beta)	Cos(gamma)	Cos(alpha)	Cos(beta)	Cos(gamma)	Angle(radians)	Flag	Cos(alpha)	Cos(beta)	Cos(gamma)	Azimuth	Plunge	Plane	Dip	Strike & Dip	degrees	m/km	m/m
0.553	0.000	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	N 58.47 W	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
0.553	0.001	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	N 58.47 W	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
0.553	0.002	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	N 58.47 W	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
0.553	0.000	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	N 58.47 W	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
0.553	0.001	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	N 58.47 W	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
0.553	0.000	0.435	-0.900	0.002	1.707	-1.000	-0.001	0.002	1.000	334.606	89.89	N 58.47 W	0.11 SE	N 58.47 W 0.11 SE	154.606	1.900	0.0019
0.553	-0.001	0.435	-0.900	0.002	1.707	-1.000	0.000	0.002	1.000	354.544	89.89	N 58.47 W	0.11 SE	N 58.47 W 0.11 SE	174.544	1.917	0.0019
0.553	0.001	0.435	-0.900	0.002	1.707	-1.000	-0.003	0.001	1.000	299.523	89.83	N 58.47 W	0.17 SE	N 58.47 W 0.17 SE	119.523	2.920	0.0029
0.553	-0.001	0.435	-0.900	0.000	1.707	-1.000	0.001	0.001	1.000	50.017	89.92	N 58.47 W	0.08 SW	N 58.47 W 0.08 SW	230.017	1.383	0.0014
0.553	-0.002	0.435	-0.900	0.000	1.707	-1.000	0.002	0.001	1.000	52.737	89.86	N 58.47 W	0.14 SW	N 58.47 W 0.14 SW	232.737	2.446	0.0024
0.553	-0.002	0.435	-0.900	0.000	1.707	-1.000	0.002	0.001	1.000	53.270	89.86	N 58.47 W	0.14 SW	N 58.47 W 0.14 SW	233.270	2.409	0.0024
0.553	0.001	0.435	-0.900	0.003	1.707	-1.000	-0.003	0.002	1.000	309.850	89.80	N 58.47 W	0.20 SE	N 58.47 W 0.20 SE	129.850	3.428	0.0034
0.553	-0.001	0.435	-0.900	0.001	1.707	-1.000	0.001	0.001	1.000	43.842	89.92	N 58.47 W	0.08 SW	N 58.47 W 0.08 SW	223.842	1.482	0.0015
0.553	0.000	0.435	-0.900	0.004	1.707	-1.000	-0.002	0.003	1.000	327.560	89.80	N 58.47 W	0.20 SE	N 58.47 W 0.20 SE	147.560	3.574	0.0036
0.553	-0.003	0.435	-0.900	0.001	1.707	-1.000	0.002	0.002	1.000	53.516	89.84	N 58.47 W	0.16 SW	N 58.47 W 0.16 SW	233.516	2.861	0.0029
0.553	-0.001	0.435	-0.900	0.002	1.707	-1.000	0.000	0.003	1.000	353.330	89.85	N 58.47 W	0.15 SE	N 58.47 W 0.15 SE	173.330	2.635	0.0026
0.553	-0.002	0.435	-0.900	0.003	1.707	-1.000	0.000	0.003	1.000	1.535	89.83	N 58.47 W	0.17 SW	N 58.47 W 0.17 SW	181.535	2.985	0.0030
0.553	-0.004	0.435	-0.900	0.000	1.707	-1.000	0.004	0.002	1.000	58.857	89.76	N 58.47 W	0.24 SW	N 58.47 W 0.24 SW	238.857	4.272	0.0043
0.553	-0.003	0.435	-0.900	0.000	1.707	-1.000	0.003	0.002	1.000	56.766	89.82	N 58.47 W	0.18 SW	N 58.47 W 0.18 SW	236.766	3.074	0.0031
0.553	0.000	0.435	-0.900	0.006	1.707	-1.000	-0.004	0.005	1.000	324.884	89.65	N 58.47 W	0.35 SE	N 58.47 W 0.35 SE	144.884	6.151	0.0062
0.553	-0.003	0.435	-0.900	-0.001	1.707	-1.000	0.003	0.000	1.000	82.410	89.81	N 58.47 W	0.19 SW	N 58.47 W 0.19 SW	262.410	3.300	0.0033
0.553	-0.001	0.435	-0.900	0.002	1.707	-1.000	0.000	0.002	1.000	7.318	89.88	N 58.47 W	0.12 SW	N 58.47 W 0.12 SW	187.318	2.181	0.0022
0.553	-0.004	0.435	-0.900	0.005	1.707	-1.000	0.001	0.005	1.000	8.766	89.69	N 58.47 W	0.31 SW	N 58.47 W 0.31 SW	188.766	5.474	0.0055
0.553	-0.001	0.435	-0.900	0.002	1.707	-1.000	0.000	0.003	1.000	352.535	89.85	N 58.47 W	0.15 SE	N 58.47 W 0.15 SE	172.535	2.545	0.0025
0.553	0.000	0.435	-0.900	0.003	1.707	-1.000	-0.002	0.003	1.000	321.347	89.80	N 58.47 W	0.20 SE	N 58.47 W 0.20 SE	141.347	3.491	0.0035
0.553	0.001	0.435	-0.900	0.004	1.707	-1.000	-0.003	0.003	1.000	314.636	89.74	N 58.47 W	0.26 SE	N 58.47 W 0.26 SE	134.636	4.612	0.0046
0.553	-0.001	0.435	-0.900	0.003	1.707	-1.000	-0.001	0.002	1.000	341.551	89.85	N 58.47 W	0.15 SE	N 58.47 W 0.15 SE	161.551	2.629	0.0026
0.553	0.000	0.435	-0.900	0.003	1.707	-1.000	-0.001	0.003	1.000	334.528	89.84	N 58.47 W	0.16 SE	N 58.47 W 0.16 SE	154.528	2.814	0.0028
0.553	-0.001	0.435	-0.900	0.003	1.707	-1.000	-0.001	0.003	1.000	345.560	89.83	N 58.47 W	0.17 SE	N 58.47 W 0.17 SE	165.560	2.975	0.0030


GRAPH A-1: Groundwater Flow Direction and Gradient - MW-1, MW-3, and MW-9
Hydraulic Flow Azimuth
Horizontal Gradient
Groundwater Flow Direction - Azimuth Degrees
Horizontal Hydraulic Gradient
360.000
270.000
180.000
90.000
0.000
0.0400
0.0300
0.0200
0.0100
0.0000
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
Date of Observation

GRAPH A-2: Groundwater Flow Direction and Gradient - MW-2, MW-4, and MW-9



ATTACHMENT B

MWH

Rockwell Collins, Inc. (Rockwell Collins) has conducted an evaluation of the potential for vapor intrusion at the former Ralston Disposal site in Cedar Rapids, Iowa (Site).

1.1 GUIDANCE

United States Environmental Protection Agency (USEPA) Region 7 conducted a five-year review of the remedial actions implemented at the Ralston Site pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended (CERCLA), and the National Contingency Plan (NCP). Accordingly, the following documents were identified as applicable guidance for the Site vapor intrusion evaluation:

- *Office of Solid Waste and Emergency Response (OSWER) Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance)* (USEPA, 2002).
- *User's Guide for Evaluating Subsurface Vapor Intrusion into Buildings* (USEPA, 2004).
- *Vapor Intrusion Pathway: A Practical Guide* (Interstate Technology & Regulatory Council [ITRC], 2007).
- *Draft USEPA's Vapor Intrusion Database: Preliminary Evaluation of Attenuation Factors (USEPA, 2008).*
- *Risk Assessment Guidance for Superfund (RAGS), Volume 1, Human Health Evaluation Manual, (Part F, Supplement Guidance for Inhalation Risk Assessment)* (USEPA, 2009).
- *Review of the Draft 2002 Subsurface Vapor Intrusion Guidance* (USEPA, 2011a)
- *Regional Screening Table User's Guide* (USEPA, 2011b).

Applicable state-specific guidance was not identified for Iowa.

1.2 PRELIMINARY SCREENING

The USEPA and ITRC guidance documents include a similar preliminary screening process to assess the potential for vapor intrusion at a site (USEPA, 2002; ITRC, 2007). A preliminary screening process based on these guidance documents is outlined in subsections 1.2.1 through 1.2.7 and is used to assess the potential for vapor intrusion.

1.2.1 Step 1 – Is an Acute Exposure Present? (No)

An acute or emergency hazard resulting from vapor intrusion in the site vicinity is not suspected. Indicators of acute scenarios, such as odors, physiological symptoms, wet basements, and/or measured or likely explosive, acutely toxic, corrosive, or chemically reactive vapor concentrations, have not been reported in buildings or connecting utility conduits in the Site vicinity.

1.2.2 Step 2 – Is Site Characterization Sufficient? (Yes)

The Site has documented soil and groundwater impacts resulting from former industrial waste disposal activities. The following components of the Site conceptual model are presented in the Remedial Investigation Report (RI Report) (MWH, 1997): site characterization, nature and extent of contamination, removal actions, contaminant fate and transport, risk assessment, and institutional controls.

Soil impacts remain in unsaturated soil on site in the former disposal area, which has been capped. There are no buildings located on site or within 300 feet of the Site. The potential for vapor intrusion from soil impacts would exist if a future building without vapor mitigation controls would be built within 100 feet of the former disposal area. However, the former disposal area and the surrounding 100-foot perimeter are either located within property controlled by Rockwell Collins and listed on the State of Iowa Registry of Hazardous Waste or Hazardous Waste Substance Disposal Sites, or within the Chicago Northwestern Transportation Company Property, as shown in Figure B-1. Therefore, institutional controls and land use control the future potentially complete vapor intrusion pathway from unsaturated soil impacts.

Based on the Site conceptual model, impacted groundwater is a potential source of contamination to indoor air in buildings in the Site vicinity. The vapor intrusion pathway was evaluated at each of the current monitoring well locations.

The extent of the alluvial aquifer groundwater impacts is depicted in Figure 5-2 of the RI Report. The highest volatile organic compound (VOC) concentrations have been historically detected near the central portion of the Site with the alluvial groundwater plume underlying the Site and extending north of the Site. The lateral extent of the alluvial aquifer groundwater plume generally follows the channel of Dry Run Creek to the northwest and northeast, which is consistent with the alluvial groundwater flow system. The extent of the alluvial aquifer has also been delineated on site to the south, in the direction of the nearest existing off-site buildings, as depicted in Figure 5-2 of the RI Report.

The extents of the Devonian and Silurian bedrock aquifer groundwater impacts are depicted in Figures 5-4 and 5-5, respectively, of the RI Report. In the Devonian and Silurian aquifers, the highest VOC concentrations have been historically detected north of the Site with groundwater impacts underlying the Site and extending off site to the south. The lateral extent of the bedrock aquifers is consistent with a predominantly southeastern direction of groundwater flow.

1.2.3 Step 3 – Are Contaminants of Potential Concern Sufficiently Volatile and Toxic? (Yes)

USEPA considers a chemical to be sufficiently volatile if the Henry's Law Constant is equal to or greater than $1x10^{-5}$ atmosphere-cubic meter per mole (USEPA, 2002). USEPA considers a chemical to be sufficiently toxic if the vapor concentration of the pure component poses an incremental lifetime cancer risk greater than $1x10^{-6}$ or a noncancer hazard index (HI) greater than 1 (USEPA, 2002). Table 1 of the USEPA guidance (2002) identifies chemicals that are sufficiently toxic and volatile to pose a concern through vapor intrusion.

The following VOCs have been detected in at least one site groundwater sample collected during the last five years of groundwater monitoring:

- Benzene
- 1,2-Dichlorobenzene
- 1,1-Dichloroethene (1,1-DCE)
- cis-1,2-Dichloroethene (cis-1,2-DCE)
- trans-1,2-Dichloroethene (trans-1,2-DCE)
- Tetrachloroethene (PCE)
- Trichloroethene (TCE)
- Vinyl chloride (VC)

Each of these compounds are identified to be sufficiently volatile and toxic to warrant further screening of the vapor intrusion pathway in Table 1 of Subsurface Vapor Intrusion Guidance (USEPA, 2002).

Since publication of the Subsurface Vapor Intrusion Guidance (USEPA, 2002), toxicity values of several of these compounds and risk assessment calculations for the inhalation exposure pathway have been revised. The noncancer reference concentrations for chronic inhalation exposure (RfCs) and cancer unit risk factors (URFs) used for the sufficiently toxic determination in the Subsurface Vapor Intrusion Guidance are provided in Table D-1 of the document (USEPA, 2002). Current noncancer RfC and cancer Inhalation Unit Risk (IUR) toxicity values for these compounds are provided in the November 2011 Regional Screening Level Resident Air Supporting Table included in Attachment B1. Target indoor air concentrations (screening levels) based on the current compound toxicity values and USEPA Region 7 risk assessment calculations were calculated for noncancer and cancer human health risk in Tables B-1 and B-2, respectively.

Maximum vapor concentrations of the pure components were calculated in Table B-3 and compared to updated target indoor air concentration screening levels based on current toxicity values in Table B-4. As shown in Table B-4, each of the compounds listed above is found to be sufficiently toxic to warrant further evaluation.

2.2.4 Step 4 – Are Buildings Located in Site Proximity Currently or in Future Use? (Yes)

USEPA guidance establishes an area within 100 feet vertically or laterally from a volatile concentration of regulatory concern as a potential impact area for vapor intrusion (USEPA, 2002). Currently, detected groundwater concentrations are limited to the MW-1, MW-2, and MW-3 monitoring wells nests located on site; and MW-7D, and the MW-9 nest located off site. There are no buildings located on site, within 100 feet of the site boundary or within 100 feet of any well with detected groundwater impacts. The closest residence (Raftis residence) to the Site or a monitoring well with detected groundwater concentrations is located approximately 350 feet south of the Site and approximately 300 feet west of the MW-9 monitoring well nest, as shown in Figure B-1. There are also no significant subsurface utilities or conduits crossing the Site that may provide preferential pathways for soil gas to migrate off site.

Future construction of buildings on the undeveloped properties located within 100 feet of the former disposal area is not likely for the following reasons:

- Rockwell Collins has control of the property surrounding the Site, as shown in Figure B-1.
- The steep topography surrounding the Site to the northeast and south, and low areas susceptible to flooding, limit accessible area for building.
- Recent development south of the Site has been conducted along Blair's Ferry Road, where zoning is for non-residential purposes.

2.2.5 Step 5 – Identify Occupant Exposure Scenarios and Screening Levels

Although there are no current or expected future buildings located within 100 feet of the Site or a monitoring well with detected groundwater concentrations, a hypothetical residential exposure scenario will be assessed for a conservative approach to the vapor intrusion evaluation.

Table 2c of the USEPA guidance document (2002) provides target groundwater screening levels corresponding to residential target indoor air concentrations where:

- Chemical partitioning from groundwater to soil gas obeys Henry's Law.
- Soil gas to indoor air attenuation factor is 0.001.
- Both target cancer risk of $1x10^{-6}$ and noncancer HI of 1 are satisfied.

Updated target residential indoor air concentrations based on current compound toxicity values and USEPA Region 7 risk assessment calculations were calculated for noncancer and cancer human health risk in Tables B-1 and B-2, respectively and summarized in Table B-4.

2.2.6 Step 6 – Do Data Exceed Screening Levels? (Yes)

The maximum groundwater concentrations detected during the last five years of groundwater monitoring at the Site were compared to the USEPA 2002 target groundwater screening levels in Table B-5. As shown in Table B-5, the maximum detected groundwater concentrations exceeded the target groundwater screening levels for the following compounds:

- Benzene
- 1,1-DCE
- cis-1,2-DCE
- trans-1,2-DCE
- TCE
- VC

However, the target groundwater screening levels in Table B-5 are based on a default attenuation factor (0.001) and are not based on current compound toxicity values. Therefore, maximum soil vapor concentrations based on maximum detected groundwater concentrations were also calculated and compared to the updated target residential indoor air concentrations that were calculated in Tables B-1 and B-2. Calculation of maximum soil vapor concentrations based on overall maximum detected groundwater concentrations is shown in Table B-6. As

shown in Table B-7, the overall maximum soil vapor concentrations exceeded the target residential indoor air concentrations for the following compounds:

- Benzene
- 1,1-DCE
- trans-1,2-DCE
- PCE
- TCE
- VC

Calculation of maximum soil vapor concentrations based on maximum groundwater concentrations detected at individual monitoring wells during the last five years and comparisons with residential target indoor air concentrations are shown in Tables B-8 through B15. Where monitoring well nests are located, maximum groundwater concentrations detected in the uppermost screened interval from 2007 to present were used to calculate maximum soil vapor concentrations. For the MW-1, MW-2, MW-3, and MW-4 well nests, the uppermost monitoring well ("A" level) is screened in the alluvial aquifer. At the MW-9 well nest, the uppermost monitoring well ("B" level) is screened in the Devonian bedrock.

Due to previous alluvial aquifer groundwater delineation presented in the RI Report (MWH, 1997), monitoring wells at the off-site MW-5 through MW-9 locations were screened only in bedrock to target the depth of greatest groundwater impact. The extent of impacts in the alluvial aquifer was delineated between the former disposal area and these bedrock well locations. Because groundwater concentrations in the bedrock aquifers are expected to exceed groundwater concentrations in the alluvial aquifer at these off-site locations, use of the bedrock aquifer groundwater concentrations is expected to provide an overestimate of the actual maximum soil vapor concentrations in the vicinity of MW-5D, MW-7D, MW-8D, and MW-9B. As shown in Tables B-8 through B-15, calculated maximum soil vapor concentrations exceeded residential target indoor air concentrations for at least one compound at the following locations: MW-1A, MW-3A, and MW-9B. For each of these exceedances, the attenuation factor that would be required to reduce the maximum soil vapor concentration to the residential target indoor air concentration was calculated in the respective tables. Each calculated AF shown in Tables B-8 through B-15 is the compound-specific target indoor air concentration divided by the maximum soil vapor concentration calculated for that compound at a particular monitoring well. The calculated AFs indicate the magnitude of attenuation required between the subsurface soil vapor and indoor air required to achieve the compound-specific target indoor air concentrations; therefore, the larger the soil vapor concentration (denominator in the equation), the smaller the calculated AF. Each calculated AF was compared to a screening AF of 1E-03, which is both a conservative USEPA screening value and a conservative empirical groundwater-to-indoor air value as described in the following paragraph.

In the Subsurface Vapor Intrusion Guidance, groundwater screening levels based on compounds partitioning from across the water table to soil gas according to Henry's Law in Table 2C: Question 4 Generic Screening Levels and Summary Sheet are based on a soil gas to a conservative indoor air attenuation factor of 1E-03 (USEPA, 2002). The 95th percentile of groundwater-to-indoor air attenuation factors based on 1,058 groundwater-to-indoor air

attenuation factors calculated from 266 buildings on 36 sites, as described in USEPA's Vapor Intrusion Database: Preliminary Evaluation of Attenuation Factors is also 1E-03 (USEPA, 2008). The empirical groundwater-to-indoor air attenuation factors were calculated by dividing measured indoor air concentrations by the soil vapor concentrations calculated from the estimated groundwater concentrations underlying the building.

As shown in Tables B-8 through B-15, calculated maximum soil vapor concentrations for one or more compounds in the vicinity of MW-1A, MW-3A, and MW-9B require an attenuation factor less than (more reduction in concentration than) the conservative value of 1E-03. At MW-1A, the calculated attenuation factors for PCE (5.8E-04), TCE (9.4E-05), and VC (1.1E-04) were less than 1E-03. The calculated attenuation factors for the following six compounds were less than 1E-03 at MW-3A: benzene (1.4E-04), 1,1-DCE (2.8E-04), trans 1,2-DCE (3.0E-04), TCE (2.6E-07), and VC (1.7E-07). At MW-9B, the calculated attenuation factors for TCE (3.4E-04) and VC (7.7E-06) were less than 1E-03.

2.2.7 Step 7 – Do Exceedances Warrant Further Investigation? (No)

The vapor intrusion evaluation described in the previous sections integrates use of the following conservative factors:

- Maximum groundwater concentrations detected during the past five years.
- Maximum observed groundwater temperature.
- Target cancer risk of 1E-06.
- Calculation of noncancer screening levels for a child resident.
- Division of noncancer screening levels by number of compounds with same target organs.
- Attenuation factor based on 95th percentile of empirical values.
- Groundwater concentrations from bedrock monitoring wells at MW-5D, MW-7D, MW-8D, and MW-9B, which are greater than groundwater concentrations in the overlying unconsolidated sediments in these off-site locations based on RI alluvial aquifer plume delineation.

This evaluation indicates vapor intrusion of VOCs from groundwater in the alluvial aquifer could potentially result in residential indoor air concentrations exceeding a target lifetime cancer risk of 1E-06 or noncancer hazard index of 1 in the vicinity of MW-1A and MW-3A, which are located near the former disposal area. The highest detected groundwater concentrations and, therefore, calculated maximum soil vapor concentrations are located at MW-3A. The closest residential buildings to MW-3A are the Thurness residence, which is located approximately 570 feet to the northeast, and the Raftis residence located approximately 560 feet to the southwest (Figure B-1). Monitoring well MW-1A is also located over 100 feet away from the nearest buildings. However, future residential development in the vicinity of these wells will not occur given Rockwell Collins ownership of the property in the area, existing institutional controls, steep topography near the Site, and surrounding land development patterns.

VOC concentrations detected in bedrock monitoring well MW-9B were also calculated to potentially result in residential indoor air concentrations exceeding a target lifetime cancer risk of 1E-06 and a noncancer hazard index of 1. However, groundwater concentrations detected in bedrock monitoring well MW-9B are not representative of actual groundwater concentrations that would partition to soil vapor, because groundwater monitored at MW-9B is overlain by over 70 feet of glacial till sediments and the extent of groundwater VOCs in the alluvial aquifer has been delineated between the former disposal area and MW-9B. Therefore, the absence of deep conduits and utilities, and the presence of shallow saturated conditions and relatively fine-grained sediments above bedrock effectively prohibit vapor intrusion of VOCs exceeding target indoor air concentrations to hypothetical future structures in the vicinity of MW-9B.

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ATTACHMENT B
TABLES

MWH

TABLE B-1

CALCULATION OF RESIDENTIAL INDOOR AIR SCREENING LEVELS BASED ON NONCANCER HEALTH RISK

Compound	RfC_i (mg/m^3)	THQ (unitless)	AT_{rc} (days)	ED_{rc} (years)	EF_{rc} (days/year)	ET_{rc} (hours/day)	*Inhalation* Noncancer Target Organ	*Number of* Compounds with Same Target Organ	$SL_{res\text{-}c\text{-}air\text{-}nc}$ ($\mu g/m^3$)
Benzene	3.0E-02 (a)	1	2190	6	350	24	Blood	1	3.1E+01
1,2-Dichlorobenzene	2.0E-01 (b)	1	2190	6	350	24	None	1	2.1E+02
1,1-Dichloroethene	2.0E-01 (a)	1	2190	6	350	24	Liver	3	7.0E+01
cis-1,2-Dichloroethene	NA	1	2190	6	350	24	NA	NA	NA
trans-1,2-Dichloroethene	6.0E-02 (c)	1	2190	6	350	24	Liver	3	2.1E+01
Tetrachloroethene	2.7E-01 (d)	1	2190	6	350	24	Nervous System	1	2.8E+02
Trichloroethene	2.0E-03 (a)	1	2190	6	350	24	Heart, Thymus	1	2.1E+00
Vinyl chloride	1.0E-01 (a)	1	2190	6	350	24	Liver	3	3.5E+01

Notes:

1. The noncancer screening levels are based on a resident child receptor residing in a home 350 days per year over a period of 6 years per United States Environmental Protection Agency (USEPA) Region VII guidance.
2. The noncancer screening levels calculated by the equation below are divided by the number of contaminants with the same target organ per USEPA Region VII guidance.

$SL_{res\text{-}c\text{-}air\text{-}nc} = [THQ*AT_{rc}*(1000\mu g/mg)]/[EF_{rc}*ED_{rc}*ET_{rc}*(1day/24hours)*(1/RfC_i)]$ Reference: USEPA November 2011 Regional Screening Table User's Guide.

Where:

$SL_{res\text{-}c\text{-}air\text{-}nc}$ = Screening level for indoor inhalation pathway of a child resident based on noncancer health risk.

RfC_i = Chronic inhalation reference concentration.

THQ = Target hazard quotient.

AT_{rc} = Averaging time for child resident (70 years X 365 days/year for carcinogenic; ED x 365 days/year for noncarcinogenic).

ED_{rc} = Exposure duration for child resident.

EF_{rc} = Exposure frequency for child resident.

ET_{rc} = Inhalation exposure time for child resident.

(a) = Value obtained from the USEPA Integrated Risk Information System (IRIS).

(b) = Value obtained from USEPA *Health Effects Assessment Summary Tables* (HEAST): Annual Update, FY 1997. NCEA, Office of Research and Development and Office of Emergency and Remedial Response (USEPA, 1997), as reported in the November 2011 RSL Tapwater Supporting Table.

(c) = Value obtained from Provisional Peer Reviewed Toxicity Values (PPRTVs), as reported in the November 2011 RSL Tapwater Supporting Table, derived by the USEPA Superfund Health Risk Technical Support Center (STSC) for the USEPA Superfund program.

(d) = Value obtained from Agency for Toxic Substances and Disease Registry (ATSDR) Minimal Risk Levels (MRLs).

mg/m^3 = Milligram(s) per cubic meter.

$\mu g/m^3$ = Microgram(s) per cubic meter.

TABLE B-2

CALCULATION OF RESIDENTIAL INDOOR AIR SCREENING LEVELS BASED ON CANCER HUMAN HEALTH RISK

Compound	IUR $(\mu g/m^3)^{-1}$		TR (unitless)	ATr (days)	ED_{rc} (years)	ED_{ra} (years)	EF_r (days/year)	ET_r (hours/day)	$SL_{res\text{-}air\text{-}ca}$ $(\mu g/m^3)$	$SL_{res\text{-}air\text{-}mu}$ $(\mu g/m^3)$	$SL_{res\text{-}air\text{-}(ca+mu)}$ $(\mu g/m^3)$	$SL_{res\text{-}air\text{-}ca\text{-}vc}$ $(\mu g/m^3)$
Benzene	7.8E-06	(a)	1.0E-06	25550	6	24	350	24	3.1E-01	NA	NA	NA
1,2-Dichlorobenzene	NC		1.0E-06	25550	6	24	350	24	NA	NA	NA	NA
1,1-Dichloroethene	NC		1.0E-06	25550	6	24	350	24	NA	NA	NA	NA
cis-1,2-Dichloroethene	NC		1.0E-06	25550	6	24	350	24	NA	NA	NA	NA
trans-1,2-Dichloroethene	NC		1.0E-06	25550	6	24	350	24	NA	NA	NA	NA
Tetrachloroethene	5.9E-06	(b)	1.0E-06	25550	6	24	350	24	4.1E-01	NA	NA	NA
Trichloroethene	4.1E-06	(a)	1.0E-06	25550	6	24	350	24	NA	NA	NA	NA
	1.0E-06	(c)	1.0E-06	25550	6	24	350	24	NA	9.6E-01	4.3E-01	NA
	3.1E-06	(d)	1.0E-06	25550	6	24	350	24	7.8E-01	NA	NA	NA
Vinyl chloride	4.4E-06	(a)	1.0E-06	25550	6	24	350	24	NA	NA	NA	1.6E-01

Notes:

1. Benzene and tetrachloroethene are considered carcinogenic without a mutagenic mode of action.
   The cancer indoor air screening levels for these compounds are based on an age-adjusted resident receptor exposed to indoor air
   350 days per year over a period of 6 years as a child and 24 years as an adult per United States Environmental Protection Agency (USEPA) Region VII guidance.
2. Vinyl chloride and trichloroethene are considered a carcinogen with a mutagenic mode of action. The mutagenic cancer screening levels are calculated for compounds considered carcinogenic via a mutagenic mode of action and are based on a resident receptor exposed to indoor air 350 days per year with Age Dependent Adjustment Factors over a period of 6 years as a child and 24 years as an adult per Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).
   The mutagen vinyl chloride has a unique set of screening level equations as shown in the USEPA November 2011 Regional Screening Level User's Guide.

$SL_{res\text{-}air\text{-}ca} = [TR*AT]/[EF_r*(ED_{rc}+ED_{ra})*ET_r*(1day/24hours)*IUR]$ Reference: USEPA November 2011 Regional Screening Table User's Guide.

$SL_{res\text{-}air\text{-}mu} = [TR*AT]/[EF_r*ET_r*(1day/24hours)*((ED_{0\text{-}2}*IUR*10)+(ED_{2\text{-}6}*IUR*3)+(ED_{6\text{-}16}*IUR*3)+(ED_{16\text{-}30}*IUR*1))]$ Reference: USEPA November 2011 Regional Screening Table User's Guide.

$SL_{res\text{-}air\text{-}(ca+mu)} = [1]/[(1/SL_{res\text{-}air\text{-}ca})+(1/SL_{res\text{-}air\text{-}mu})]$ Reference: USEPA November 2011 Regional Screening Table User's Guide.

$SL_{res\text{-}air\text{-}ca\text{-}vc} = [TR]/[IUR+ ((IUR*EF_r*(ED_{rc}+ED_{ra})*ET_r*(1day/24hours))/AT)]$ Reference: USEPA November 2011 Regional Screening Table User's Guide.

Where:

$SL_{res\text{-}air\text{-}ca}$ = Screening level for indoor inhalation pathway of a resident based on cancer health risk without mutagenic mode of action.

$SL_{res\text{-}air\text{-}ca\text{-}vc}$ = Screening level for indoor inhalation pathway of a resident based on cancer health risk for vinyl chloride.

IUR = Inhalation unit risk.

TR = Target cancer risk.

AT_r = Averaging time for resident (70 years X 365 days/year for carcinogenic; ED x 365 days/year for noncarcinogenic).

ED_{ra} = Exposure duration for adult resident.

ED_{rc} = Exposure duration for child resident.

$ED_{0\text{-}2}$ = Exposure duration for resident 0-2 years old.

$ED_{2\text{-}6}$ = Exposure duration for resident 2-6 years old.

$ED_{6\text{-}16}$ = Exposure duration for resident 6-16 years old.

$ED_{16\text{-}30}$ = Exposure duration for resident 16-30 years old.

EF_r = Exposure frequency for resident.

ET_r = Inhalation exposure time for resident.

(a) = Value obtained from the USEPA Integrated Risk Information System (IRIS).

(b) = Value obtained from California Environmental Protection Agency (OEHHA) Office of Environmental Health Hazard Assessment's Chronic Reference Exposure Levels (RELS) from December 18, 2008 and the Cancer Potency Values from July 21, 2009, as reported in the November 2011 RSL Resident Air Supporting Table.

(c) = Value (kidney mutagenic endpoint) obtained from the USEPA November 2011 Regional Screening Table Frequently Asked Questions.

(d) = Value (non-Hodgkin's lymphoma/liver cancer endpoint) obtained from the USEPA November 2011 Regional Screening Table Frequently Asked Questions.

$\mu g/m^3$ = Microgram(s) per cubic meter.

NA = Not applicable.

NC = Not a considered a carcinogen.

TABLE B-3

CALCULATION OF MAXIMUM PURE COMPONENT VAPOR CONCENTRATION

Compound	Aqueous Solubility at 25 °C (S) [a] (mg/L)	Dimensionless Henry's Law Constant at 25 °C (H') [a] (unitless)	Maximum Pure Component Vapor Concentration at 25 °C ($C_{max, vp}$) [b] ($\mu g/m^3$)
Benzene	1790	0.2269011	4.06E+08
1,2-Dichlorobenzene	156	0.0784955	1.22E+07
1,1-Dichloroethene	2420	1.0670482	2.58E+09
cis-1,2-Dichloroethene	6410	0.1668029	1.07E+09
trans-1,2-Dichloroethene	4520	0.1668029	7.54E+08
Tetrachloroethene	206	0.7236304	1.49E+08
Trichloroethene	1280	0.4026983	5.15E+08
Vinyl chloride	8800	1.1365495	1.00E+10

Notes:

[a] = United States Environmental Protection Agency Estimation Program Interface Suite ™ (EPI Suite ™).

[b] = $C_{max,vp} = S \times H' \times (1000\mu g/1mg) \times (1L/1000mL) \times (1mL/1cm^3) \times (100cm/1m)^3$

Reference: Appendix D of Subsurface Vapor Intrusion Guidance (USEPA, 2002).

mg/L = Milligram(s) per liter.

$\mu g/m^3$ = Microgram(s) per cubic meter.

TABLE B4

DETERMINATION OF SUFFICIENT TOXICITY FOR CONCERN THROUGH THE VAPOR INTRUSION PATHWAY

Compound	$C_{max, vp}$ [a] (µg/m^3)	$SL_{res\text{-}c\text{-}air\text{-}nc}$ [b] (µg/m^3)	$SL_{res\text{-}air\text{-}ca}$ [c] (µg/m^3)	$SL_{res\text{-}air\text{-}mu}$ [d] (µg/m^3)	$SL_{res\text{-}air\text{-}(ca+mu)}$ [e] (µg/m^3)	$SL_{res\text{-}air\text{-}ca\text{-}vc}$ [f] (µg/m^3)	Most Conservative Screening Level (µg/m^3)	Sufficiently Toxic [g]?
Benzene	4.06E+08	3.1E+01	3.1E-01	NA	NA	NA	3.1E-01	Yes
1,2-Dichlorobenzene	1.22E+07	2.1E+02	NA	NA	NA	NA	2.1E+02	Yes
1,1-Dichloroethene	2.58E+09	7.0E+01	NA	NA	NA	NA	7.0E+01	Yes
cis-1,2-Dichloroethene	1.07E+09	NA	NA	NA	NA	NA	NA	Yes
trans-1,2-Dichloroethene	7.54E+08	2.1E+01	NA	NA	NA	NA	2.1E+01	Yes
Tetrachloroethene	1.49E+08	2.8E+02	4.1E-01	NA	NA	NA	4.1E-01	Yes
Trichloroethene	5.15E+08	2.1E+00	7.8E-01	9.6E-01	4.3E-01	NA	4.3E-01	Yes
Vinyl chloride	1.00E+10	3.5E+01	NA	NA	NA	1.6E-01	1.6E-01	Yes

Notes:

[a] = Maximum Pure Component Vapor Concentration at 25 °C calculated in Table B-3.

[b] = Screening level for indoor inhalation pathway of a child resident based on noncancer health risk calculated in Table B-1.

[c] = Screening level for indoor inhalation pathway of a resident based on cancer health risk without mutagenic mode of action calculated in Table B-2.

[d] = Screening level for indoor inhalation pathway of a resident based on cancer health risk with a mutagenic mode of action calculated in Table B-2.

[e] = Screening level for indoor inhalation pathway of a resident based on cancer health risk with both a mutagenic and non-mutagenic mode of action calculated in Table B-2.

[f] = Screening level for indoor inhalation pathway of a resident based on cancer health risk for vinyl chloride calculated in Table B-2.

[g] = A contaminant was determined to be sufficiently toxic to pose an unacceptable inhalation risk (incremental lifetime cancer risk greater than 1E-06 or noncancer hazard index greater than 1) if the calculated $C_{max, vp}$ was greater than one or more of the calculated indoor air screening levels.

µg/m^3 = Microgram(s) per cubic meter.

NA = Not applicable.

TABLE B-5

COMPARISON OF MAXIMUM DETECTED GROUNDWATER CONCENTRATIONS TO USEPA 2002 GROUNDWATER SCREENING LEVELS

Compound	Maximum Groundwater Concentration (C_w) [a] (µg/L)	Target Groundwater Concentration [b] (C_{gw}) (µg/L)	$C_w > C_{gw}$
Benzene	14.9	5	Yes
1,2-Dichlorobenzene	4.19	2600	No
1,1-Dichloroethene	321	190	Yes
cis-1,2-Dichloroethene	30800	210	Yes
trans-1,2-Dichloroethene	261	180	Yes
Tetrachloroethene	1.59	5	No
Trichloroethene	6140	5	Yes
Vinyl chloride	1100	2	Yes

Notes:

[a] Highest concentration detected in site monitoring wells during last five years of groundwater monitoring.

[b] Target groundwater concentration corresponding to target indoor air concentration where partitioning across the water table obeys Henry's Law, the soil gas to indoor air attenuation factor is 0.001, and the prescribed risk levels are target cancer risk = 1E-06 and Hazard Index=1.
Reference: Table 2C: Question 4 Generic Screening Levels and Summary Sheet in Subsurface Vapor Intrusion Guidance (United States Environmental Protection Agency [USEPA], 2002).

µg/L = Microgram(s) per liter.

TABLE B-6

CALCULATION OF SOIL VAPOR CONCENTRATIONS AT WATER TABLE FROM GROUNDWATER SOURCE

Compound	Maximum Groundwater Concentration (C_W) [a] (µg/L)	System Temperature (T_S) [b] (K)	Critical Temperature (T_C) [c] (K)	Normal Boiling Point (T_B) [c] (K)	T_B/T_C	Constant (n) [c] (unitless)	Enthalpy of Vaporization at Normal Boiling Point [c] (cal/mol)	Enthalpy of Vaporization at T_C ($\Delta Hv,T_S$)) [c] (cal/mol)	Henry's Law Constant Reference Temperature (T_R) [c] (K)	Henry's Law Constant at T_R (H_R) (atm-m^3/mol)	Gas Constant R_c [c] (cal/mol-K)	Gas Constant R (atm-m^3/mol-K)	Dimensionless Henry's Law Constant at T_S (H'_{TS}) (unitless)	Maximum Source Soil Vapor Concentration (C_{source}) [d] (µg/m^3)
Benzene	14.9	288.25	562.16	353.24	0.63	0.35	7342	8070	298.15	5.56E-03	1.9872	8.205E-05	1.47E-01	2.2E+03
1,2-Dichlorobenzene	4.19	288.25	705.00	180.42	0.26	0.30	9700	9053	298.15	1.90E-03	1.9872	8.205E-05	4.75E-02	2.0E+02
1,1-Dichloroethene	321	288.25	576.05	304.75	0.53	0.30	6247	6359	298.15	2.61E-02	1.9872	8.205E-05	7.63E-01	2.5E+05
cis-1,2-Dichloroethene	30800	288.25	544.00	333.65	0.61	0.34	7192	7683	298.15	4.07E-03	1.9872	8.205E-05	1.10E-01	3.4E+06
trans-1,2-Dichloroethene	261	288.25	516.50	320.85	0.62	0.34	6717	7082	298.15	9.39E-03	1.9872	8.205E-05	2.63E-01	6.9E+04
Tetrachloroethene	1.59	288.25	620.20	394.40	0.64	0.35	8288	9501	298.15	1.84E-02	1.9872	8.205E-05	4.49E-01	7.1E+02
Trichloroethene	6140	288.25	544.20	360.36	0.66	0.37	7505	8494	298.15	1.03E-02	1.9872	8.205E-05	2.66E-01	1.6E+06
Vinyl chloride	1100	288.25	432.00	259.25	0.60	0.33	5250	4943	298.15	2.71E-02	1.9872	8.205E-05	8.60E-01	9.5E+05

Notes:

[a] Highest concentration detected in site monitoring wells during last five years of groundwater monitoring.

[b] Highest groundwater temperature recorded during purging of site monitoring wells (15.1 °C/59.18 °F).

[c] Value provided in Appendix C of *User's Guide for Evaluating Subsurface Vapor Intrusion into Buildings* (USEPA, 2004).

[d] Vapor concentration at the source of contamination. C_{source} for groundwater contamination is estimated assuming the vapor and aqueous phases are in local equilibrium according to Henry's Law.

$C_{source} = H'_{TS}*C_W*(1L/1000mL) \times (1mL/1cm3) \times (100cm/1m)^3$ Reference: Equation 2 of *User's Guide for Evaluating Subsurface Vapor Intrusion into Buildings* (USEPA, 2004).

$H'_{TS} = [(\exp(-\Delta H_{v,TS}/R_C*(1/T_S-1/T_R)))*H_R]/R*T_S$ Reference: Equation 3 of *User's Guide for Evaluating Subsurface Vapor Intrusion into Buildings* (USEPA, 2004).

$\Delta H_{v,TS} = \Delta H_{v,b}*[(1-T_S/T_C)/(1-T_B/T_C)]^n$ Reference: Equation 4 of *User's Guide for Evaluating Subsurface Vapor Intrusion into Buildings* (USEPA, 2004).

Where:

H'_{TS} = Henry's law constant at the system (groundwater) temperature.
C_W = Groundwater concentration.
$\Delta H_{v,TS}$ = Enthalpy of vaporization at the system temperature.
T_S = System temperature.
T_R = Henry's law constant reference temperature.
H_R = Henry's law constant at the reference temperature.
R_C = Gas constant.
R = Gas constant.
$\Delta H_{v,b}$ = Enthalpy of vaporization at the normal boiling point.
T_C = Critical temperature.
T_B = Normal boiling point.
n = Constant as a function of the ration T_B/T_C as indicated in Table 2 of *User's Guide for Evaluating Subsurface Vapor Intrusion into Building*s (USEPA, 2004).

µg/L = Microgram(s) per liter.
µg/m^3 = Microgram(s) per cubic meter.
K = Kelvin.
Cal/mol = Calories per mole.
atm = Atmosphere(s).
mol = Mole(s).
m^3 = Cubic meter(s).

TABLE B-7

COMPARISON OF CALCULATED SOIL VAPOR CONCENTRATIONS TO RESIDENTIAL INDOOR AIR SCREENING LEVELS

Compound	C_{source} [a] ($\mu g/m^3$)	SL [b] ($\mu g/m^3$)	C_{source} > SL	AF to Achieve SL
Benzene	2.2E+03	3.1E-01	Yes	1.4E-04
1,2-Dichlorobenzene	2.0E+02	2.1E+02	No	NA
1,1-Dichloroethene	2.5E+05	7.0E+01	Yes	2.8E-04
cis-1,2-Dichloroethene	3.4E+06	NA	NA	NA
trans-1,2-Dichloroethene	6.9E+04	2.1E+01	Yes	3.0E-04
Tetrachloroethene	7.1E+02	4.1E-01	Yes	5.8E-04
Trichloroethene	1.6E+06	4.3E-01	Yes	2.6E-07
Vinyl chloride	9.5E+05	1.6E-01	Yes	1.7E-07

Notes:

[a] = Maximum soil vapor concentrations from maximum groundwater concentrations at system ter calculated in Table B-6.

[b] = Most consevative screening level determined in Table B-4.

$AF = SL/C_{source}$

Where:

AF = Vapor intrusion attenuation factor.

C_{source} = Vapor concentration at the groundwater source of contamination.

SL = Screening level.

$\mu g/m^3$ = Microgram(s) per cubic meter.

NA = Not applicable.

TABLE B-8

EVALUATION OF VAPOR INTRUSION POTENTIAL OF COMPOUNDS FROM GROUNDWATER TO INDOOR AIR IN THE VICINITY OF MW-1A

Compound	MW-1A Maximum Groundwater Concentration (C_W) [a] (µg/L)	Maximum Source Soil Vapor Concentration(C_{source}) [b] (µg/m^3)	Target Indoor Air Concentration [c] (µg/m^3)	C_{source} > Target Indoor Air Concentration	AF to Achieve Target Indoor Air Concentration [d]	AF>1E-03 [e,f]
Benzene	ND	NA	3.1E-01	No	NA	NA
1,2-Dichlorobenzene	ND	NA	2.1E+02	No	NA	NA
1,1-Dichloroethene	ND	NA	7.0E+01	No	NA	NA
cis-1,2-Dichloroethene	20.5	2.26E+03	NA	NA	NA	NA
trans-1,2-Dichloroethene	ND	NA	2.1E+01	No	NA	NA
Tetrachloroethene	1.59	7.13E+02	4.1E-01	Yes	5.8E-04	No
Trichloroethene	17.2	4.58E+03	4.3E-01	Yes	9.4E-05	No
Vinyl chloride	1.75	1.51E+03	1.6E-01	Yes	1.1E-04	No

Notes:

1. The greater the AF value, the lesser the degree of attenuation (reduction in concentration) from the subsurface to indoor air. For example, an AF calculated in this table greater than 1E-03 indicates less reduction in concentration from soil vapor to indoor air is required to meet the target indoor concentration at the site than is typically observed from soil vapor based on a groundwater source to indoor air in the USEPA vapor intrusion database.

[a] Highest concentration detected in the site monitoring well during last five years of groundwater monitoring.

[b] Maximum soil vapor concentration resulting from the maximum detected groundwater concentration assuming the vapor and aqueous phases are in local equilibrium according to Henry's Law. Calculated as shown in Table B-6.

[c] Most conservative (lowest) value of the noncancer and cancer screening levels calculated for the compound in Tables B-1 and B-2.

[d] The AF is the ratio of the indoor air concentration arising from vapor intrusion to the subsurface vapor concentration at a point or depth of interest in the vapor intrusion pathway. The AF indicates the degree of reduction in soil vapor concentration of a compound entering a building through vapor intrusion required to meet the target indoor air concentration.

[e] Groundwater screening levels based on compounds partitioning from across the water table to soil gas according to Henry's Law in Table 2C: Question 4 Generic Screening Levels and Summary Sheet in Subsurface Vapor Intrusion Guidance (USEPA, 2002) uses a soil gas to indoor air attenuation factor of 1E-03.

[f] 95th percentile of groundwater-to-indoor air AFs based on 1,058 groundwater-to-indoor air AFs calculated from 266 buildings on 36 sites as described in USEPA's Vapor Intrusion Database: Preliminary Evaluation of Attenuation Factors (USEPA, 2008). The empirical groundwater-to-indoor air AFs were calculated by dividing measured indoor air concentrations by the soil vapor concentrations calculated from the estimated groundwater concentration underlying the building. The soil vapor concentrations were estimated by multiplying the estimated groundwater concentration by the compound's dimensionless Henry's law constant, as was done to calculate C_{source} in this table.

$C_{source} = H'_{TS} * C_W$ Reference: Equation 2 of *User's Guide for Evaluating Subsurface Vapor Intrusion into Buildings* (USEPA, 2004).
AF = Target Indoor Air Concentration/C_{source}.

AF = Vapor intrusion attenuation factor.
µg/m^3 = Microgram(s) per cubic meter.
µg/L = Microgram(s) per liter.

TABLE B-9

EVALUATION OF VAPOR INTRUSION POTENTIAL OF COMPOUNDS FROM GROUNDWATER TO INDOOR AIR IN THE VICINITY OF MW-2A

Compound	MW-2A Maximum Groundwater Concentration (C_W) [a] (µg/L)	Maximum Source Soil Vapor Concentration(C_{source}) [b] (µg/m^3)	Target Indoor Air Concentration [c] (µg/m^3)	C_{source} > Target Indoor Air Concentration	AF to Achieve Target Indoor Air Concentration [d]	AF>1E-03 [e,f]
Benzene	ND	NA	3.1E-01	No	NA	NA
1,2-Dichlorobenzene	ND	NA	2.1E+02	No	NA	NA
1,1-Dichloroethene	ND	NA	7.0E+01	No	NA	NA
cis-1,2-Dichloroethene	1.35	1.49E-01	NA	NA	NA	NA
trans-1,2-Dichloroethene	ND	NA	2.1E+01	No	NA	NA
Tetrachloroethene	ND	NA	4.1E-01	No	NA	NA
Trichloroethene	ND	NA	4.3E-01	No	NA	NA
Vinyl chloride	ND	NA	1.6E-01	No	NA	NA

Notes:

1. The greater the AF value, the lesser the degree of attenuation (reduction in concentration) from the subsurface to indoor air. For example, an AF calculated in this table greater than 1E-03 indicates less reduction in concentration from soil vapor to indoor air is required to meet the target indoor concentration at the site than is typically observed from soil vapor based on a groundwater source to indoor air in the USEPA vapor intrusion database.

[a] Highest concentration detected in the site monitoring well during last five years of groundwater monitoring.

[b] Maximum soil vapor concentration resulting from the maximum detected groundwater concentration assuming the vapor and aqueous phases are in local equilibrium according to Henry's Law. Calculated as shown in Table B-6.

[c] Most conservative (lowest) value of the noncancer and cancer screening levels calculated for the compound in Tables B-1 and B-2.

[d] The AF is the ratio of the indoor air concentration arising from vapor intrusion to the subsurface vapor concentration at a point or depth of interest in the vapor intrusion pathway. The AF indicates the degree of reduction in soil vapor concentration of a compound entering a building through vapor intrusion required to meet the target indoor air concentration.

[e] Groundwater screening levels based on compounds partitioning from across the water table to soil gas according to Henry's Law in Table 2C: Question 4 Generic Screening Levels and Summary Sheet in Subsurface Vapor Intrusion Guidance (USEPA, 2002) uses a soil gas to indoor air attenuation factor of 1E-03.

[f] 95th percentile of groundwater-to-indoor air AFs based on 1,058 groundwater-to-indoor air AFs calculated from 266 buildings on 36 sites as described in USEPA's Vapor Intrusion Database: Preliminary Evaluation of Attenuation Factors (USEPA, 2008). The empirical groundwater-to-indoor air AFs were calculated by dividing measured indoor air concentrations by the soil vapor concentrations calculated from the estimated groundwater concentration underlying the building. The soil vapor concentrations were estimated by multiplying the estimated groundwater concentration by the compound's dimensionless Henry's law constant, as was done to calculate C_{source} in this table.

$C_{source} = H'_{TS} * C_W$ Reference: Equation 2 of *User's Guide for Evaluating Subsurface Vapor Intrusion into Buildings* (USEPA, 2004).
AF = Target Indoor Air Concentration/Csource.

AF = Vapor intrusion attenuation factor.
µg/m^3 = Microgram(s) per cubic meter.
µg/L = Microgram(s) per liter.
NA = Not applicable.
ND = Not detected.

TABLE B-10

EVALUATION OF VAPOR INTRUSION POTENTIAL OF COMPOUNDS FROM GROUNDWATER TO INDOOR AIR IN THE VICINITY OF MW-3A

Compound	MW-3A Maximum Groundwater Concentration (C_W) [a] (µg/L)	Maximum Source Soil Vapor Concentration(C_{source}) [b] (µg/m^3)	Target Indoor Air Concentration [c] (µg/m^3)	C_{source} > Target Indoor Air Concentration	AF to Achieve Target Indoor Air Concentration [d]	AF>1E-03 [e,f]
Benzene	14.9	2.19E+03	3.1E-01	Yes	1.4E-04	No
1,2-Dichlorobenzene	4.19	1.99E+02	2.1E+02	No	1.0E+00	Yes
1,1-Dichloroethene	321	2.45E+05	7.0E+01	Yes	2.8E-04	No
cis-1,2-Dichloroethene	30800	3.40E+06	NA	NA	NA	NA
trans-1,2-Dichloroethene	261	6.87E+04	2.1E+01	Yes	3.0E-04	No
Tetrachloroethene	ND	NA	4.1E-01	Yes	NA	NA
Trichloroethene	6140	1.63E+06	4.3E-01	Yes	2.6E-07	No
Vinyl chloride	1100	9.46E+05	1.6E-01	Yes	1.7E-07	No

Notes:

1. The greater the AF value, the lesser the degree of attenuation (reduction in concentration) from the subsurface to indoor air. For example, an AF calculated in this table greater than 1E-03 indicates less reduction in concentration from soil vapor to indoor air is required to meet the target indoor concentration at the site than is typically observed from soil vapor based on a groundwater source to indoor air in the USEPA vapor intrusion database.

[a] Highest concentration detected in the site monitoring well during last five years of groundwater monitoring.

[b] Maximum soil vapor concentration resulting from the maximum detected groundwater concentration assuming the vapor and aqueous phases are in local equilibrium according to Henry's Law.

[c] Most conservative (lowest) value of the noncancer and cancer screening levels calculated for the compound in Tables B-1 and B-2.

[d] The AF is the ratio of the indoor air concentration arising from vapor intrusion to the subsurface vapor concentration at a point or depth of interest in the vapor intrusion pathway. The AF indicates the degree of reduction in soil vapor concentration of a compound entering a building through vapor intrusion required to meet the target indoor air concentration.

[e] Groundwater screening levels based on compounds partitioning from across the water table to soil gas according to Henry's Law in Table 2C: Question 4 Generic Screening Levels and Summary Sheet in Subsurface Vapor Intrusion Guidance (USEPA, 2002) uses a soil gas to indoor air attenuation factor of 1E-03.

[f] 95th percentile of groundwater-to-indoor air AFs based on 1,058 groundwater-to-indoor air AFs calculated from 266 buildings on 36 sites as described in USEPA's Vapor Intrusion Database: Preliminary Evaluation of Attenuation Factors (USEPA, 2008). The empirical groundwater-to-indoor air AFs were calculated by dividing measured indoor air concentrations by the soil vapor concentrations calculated from the estimated groundwater concentration underlying the building. The soil vapor concentrations were estimated by multiplying the estimated groundwater concentration by the compound's dimensionless Henry's law constant, as was done to calculate C_{source} in this table.

$C_{source} = H'_{TS} * C_W$ Calculated as shown in Table B-6. Reference: Equation 2 of *User's Guide for Evaluating Subsurface Vapor Intrusion into Buildings* (USEPA, 2004).
AF = Target Indoor Air Concentration/Csource.

AF = Vapor intrusion attenuation factor.
µg/m^3 = Microgram(s) per cubic meter.
µg/L = Microgram(s) per liter.
NA = Not applicable.
ND = Not detected.

TABLE B-11

EVALUATION OF VAPOR INTRUSION POTENTIAL OF COMPOUNDS FROM GROUNDWATER TO INDOOR AIR IN THE VICINITY OF MW-4A

Compound	MW-4A Maximum Groundwater Concentration (C_W) [a] (µg/L)	Maximum Source Soil Vapor Concentration(C_{source}) [b] (µg/m^3)	Target Indoor Air Concentration [c] (µg/m^3)	C_{source} > Target Indoor Air Concentration	AF to Achieve Target Indoor Air Concentration [d]	AF>1E-03 [e,f]
Benzene	ND	NA	3.1E-01	No	NA	NA
1,2-Dichlorobenzene	ND	NA	2.1E+02	No	NA	NA
1,1-Dichloroethene	ND	NA	7.0E+01	No	NA	NA
cis-1,2-Dichloroethene	ND	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	ND	NA	2.1E+01	No	NA	NA
Tetrachloroethene	ND	NA	4.1E-01	No	NA	NA
Trichloroethene	ND	NA	4.3E-01	No	NA	NA
Vinyl chloride	ND	NA	1.6E-01	No	NA	NA

Notes:

1. The greater the AF value, the lesser the degree of attenuation (reduction in concentration) from the subsurface to indoor air. For example, an AF calculated in this table greater than 1E-03 indicates less reduction in concentration from soil vapor to indoor air is required to meet the target indoor concentration at the site than is typically observed from soil vapor based on a groundwater source to indoor air in the USEPA vapor intrusion database.

[a] Highest concentration detected in the site monitoring well during last five years of groundwater monitoring.

[b] Maximum soil vapor concentration resulting from the maximum detected groundwater concentration assuming the vapor and aqueous phases are in local equilibrium according to Henry's Law.

[c] Most conservative (lowest) value of the noncancer and cancer screening levels calculated for the compound in Tables B-1 and B-2.

[d] The AF is the ratio of the indoor air concentration arising from vapor intrusion to the subsurface vapor concentration at a point or depth of interest in the vapor intrusion pathway. The AF indicates the degree of reduction in soil vapor concentration of a compound entering a building through vapor intrusion required to meet the target indoor air concentration.

[e] Groundwater screening levels based on compounds partitioning from across the water table to soil gas according to Henry's Law in Table 2C: Question 4 Generic Screening Levels and Summary Sheet in Subsurface Vapor Intrusion Guidance (USEPA, 2002) uses a soil gas to indoor air attenuation factor of 1E-03.

[f] 95th percentile of groundwater-to-indoor air AFs based on 1,058 groundwater-to-indoor air AFs calculated from 266 buildings on 36 sites as described in USEPA's Vapor Intrusion Database: Preliminary Evaluation of Attenuation Factors (USEPA, 2008). The empirical groundwater-to-indoor air AFs were calculated by dividing measured indoor air concentrations by the soil vapor concentrations calculated from the estimated groundwater concentration underlying the building. The soil vapor concentrations were estimated by multiplying the estimated groundwater concentration by the compound's dimensionless Henry's law constant, as was done to calculate C_{source} in this table.

$C_{source} = H'_{TS} * C_W$ Calculated as shown in Table B-6. Reference: Equation 2 of *User's Guide for Evaluating Subsurface Vapor Intrusion into Buildings* (USEPA, 2004).
AF = Target Indoor Air Concentration/Csource.

AF = Vapor intrusion attenuation factor.
µg/m^3 = Microgram(s) per cubic meter.
µg/L = Microgram(s) per liter.
NA = Not applicable.
ND = Not detected.

TABLE B-12

EVALUATION OF VAPOR INTRUSION POTENTIAL OF COMPOUNDS FROM GROUNDWATER TO INDOOR AIR IN THE VICINITY OF MW-5D

Compound	MW-5D Maximum Groundwater Concentration (C_W) [a] (µg/L)	Maximum Source Soil Vapor Concentration(C_{source}) [b] (µg/m^3)	Target Indoor Air Concentration [c] (µg/m^3)	C_{source} > Target Indoor Air Concentration	AF to Achieve Target Indoor Air Concentration [d]	AF>1E-03 [e,f]
Benzene	ND	NA	3.1E-01	No	NA	NA
1,2-Dichlorobenzene	ND	NA	2.1E+02	No	NA	NA
1,1-Dichloroethene	ND	NA	7.0E+01	No	NA	NA
cis-1,2-Dichloroethene	ND	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	ND	NA	2.1E+01	No	NA	NA
Tetrachloroethene	ND	NA	4.1E-01	No	NA	NA
Trichloroethene	ND	NA	4.3E-01	No	NA	NA
Vinyl chloride	ND	NA	1.6E-01	No	NA	NA

Notes:

1. The greater the AF value, the lesser the degree of attenuation (reduction in concentration) from the subsurface to indoor air. For example, an AF calculated in this table greater than 1E-03 indicates less reduction in concentration from soil vapor to indoor air is required to meet the target indoor concentration at the site than is typically observed from soil vapor based on a groundwater source to indoor air in the USEPA vapor intrusion database.

[a] Highest concentration detected in the site monitoring well during last five years of groundwater monitoring.

[b] Maximum soil vapor concentration resulting from the maximum detected groundwater concentration assuming the vapor and aqueous phases are in local equilibrium according to Henry's Law.

[c] Most conservative (lowest) value of the noncancer and cancer screening levels calculated for the compound in Tables B-1 and B-2.

[d] The AF is the ratio of the indoor air concentration arising from vapor intrusion to the subsurface vapor concentration at a point or depth of interest in the vapor intrusion pathway. The AF indicates the degree of reduction in soil vapor concentration of a compound entering a building through vapor intrusion required to meet the target indoor air concentration.

[e] Groundwater screening levels based on compounds partitioning from across the water table to soil gas according to Henry's Law in Table 2C: Question 4 Generic Screening Levels and Summary Sheet in Subsurface Vapor Intrusion Guidance (USEPA, 2002) uses a soil gas to indoor air attenuation factor of 1E-03.

[f] 95th percentile of groundwater-to-indoor air AFs based on 1,058 groundwater-to-indoor air AFs calculated from 266 buildings on 36 sites as described in USEPA's Vapor Intrusion Database: Preliminary Evaluation of Attenuation Factors (USEPA, 2008). The empirical groundwater-to-indoor air AFs were calculated by dividing measured indoor air concentrations by the soil vapor concentrations calculated from the estimated groundwater concentration underlying the building. The soil vapor concentrations were estimated by multiplying the estimated groundwater concentration by the compound's dimensionless Henry's law constant, as was done to calculate C_{source} in this table.

$C_{source} = H'_{TS} * C_W$ Calculated as shown in Table B-6. Reference: Equation 2 of *User's Guide for Evaluating Subsurface Vapor Intrusion into Buildings* (USEPA, 2004).
AF = Target Indoor Air Concentration/Csource.

AF = Vapor intrusion attenuation factor.
µg/m^3 = Microgram(s) per cubic meter.
µg/L = Microgram(s) per liter.
NA = Not applicable.
ND = Not detected.

TABLE B-13

EVALUATION OF VAPOR INTRUSION POTENTIAL OF COMPOUNDS FROM GROUNDWATER TO INDOOR AIR IN THE VICINITY OF MW-7D

Compound	MW-7D Maximum Groundwater Concentration (C_W) [a] (µg/L)	Maximum Source Soil Vapor Concentration(C_{source}) [b] (µg/m^3)	Target Indoor Air Concentration [c] (µg/m^3)	C_{source} > Target Indoor Air Concentration	AF to Achieve Target Indoor Air Concentration [d]	AF>1E-03 [e,f]
Benzene	ND	NA	3.1E-01	No	NA	NA
1,2-Dichlorobenzene	ND	NA	2.1E+02	No	NA	NA
1,1-Dichloroethene	ND	NA	7.0E+01	No	NA	NA
cis-1,2-Dichloroethene	1.56	1.72E+02	NA	NA	NA	NA
trans-1,2-Dichloroethene	ND	NA	2.1E+01	No	NA	NA
Tetrachloroethene	ND	NA	4.1E-01	No	NA	NA
Trichloroethene	ND	NA	4.3E-01	No	NA	NA
Vinyl chloride	ND	NA	1.6E-01	No	NA	NA

Notes:

1. The greater the AF value, the lesser the degree of attenuation (reduction in concentration) from the subsurface to indoor air. For example, an AF calculated in this table greater than 1E-03 indicates less reduction in concentration from soil vapor to indoor air is required to meet the target indoor concentration at the site than is typically observed from soil vapor based on a groundwater source to indoor air in the USEPA vapor intrusion database.

[a] Highest concentration detected in the site monitoring well during last five years of groundwater monitoring.

[b] Maximum soil vapor concentration resulting from the maximum detected groundwater concentration assuming the vapor and aqueous phases are in local equilibrium according to Henry's Law.

[c] Most conservative (lowest) value of the noncancer and cancer screening levels calculated for the compound in Tables B-1 and B-2.

[d] The AF is the ratio of the indoor air concentration arising from vapor intrusion to the subsurface vapor concentration at a point or depth of interest in the vapor intrusion pathway. The AF indicates the degree of reduction in soil vapor concentration of a compound entering a building through vapor intrusion required to meet the target indoor air concentration.

[e] Groundwater screening levels based on compounds partitioning from across the water table to soil gas according to Henry's Law in Table 2C: Question 4 Generic Screening Levels and Summary Sheet in Subsurface Vapor Intrusion Guidance (USEPA, 2002) uses a soil gas to indoor air attenuation factor of 1E-03.

[f] 95th percentile of groundwater-to-indoor air AFs based on 1,058 groundwater-to-indoor air AFs calculated from 266 buildings on 36 sites as described in USEPA's Vapor Intrusion Database: Preliminary Evaluation of Attenuation Factors (USEPA, 2008). The empirical groundwater-to-indoor air AFs were calculated by dividing measured indoor air concentrations by the soil vapor concentrations calculated from the estimated groundwater concentration underlying the building. The soil vapor concentrations were estimated by multiplying the estimated groundwater concentration by the compound's dimensionless Henry's law constant, as was done to calculate C_{source} in this table.

$C_{source} = H'_{TS} * C_W$ Calculated as shown in Table B-6. Reference: Equation 2 of *User's Guide for Evaluating Subsurface Vapor Intrusion into Buildings* (USEPA, 2004).
AF = Target Indoor Air Concentration/Csource.

AF = Vapor intrusion attenuation factor.
µg/m^3 = Microgram(s) per cubic meter.
µg/L = Microgram(s) per liter.
NA = Not applicable.
ND = Not detected.

TABLE B-14

EVALUATION OF VAPOR INTRUSION POTENTIAL OF COMPOUNDS FROM GROUNDWATER TO INDOOR AIR IN THE VICINITY OF MW-8D

Compound	MW-8D Maximum Groundwater Concentration (C_W) [a] (µg/L)	Maximum Source Soil Vapor Concentration(C_{source}) [b] (µg/m^3)	Target Indoor Air Concentration [c] (µg/m^3)	C_{source} > Target Indoor Air Concentration	AF to Achieve Target Indoor Air Concentration [d]	AF>1E-03 [e,f]
Benzene	ND	NA	3.1E-01	No	NA	NA
1,2-Dichlorobenzene	ND	NA	2.1E+02	No	NA	NA
1,1-Dichloroethene	ND	NA	7.0E+01	No	NA	NA
cis-1,2-Dichloroethene	ND	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	ND	NA	2.1E+01	No	NA	NA
Tetrachloroethene	ND	NA	4.1E-01	No	NA	NA
Trichloroethene	ND	NA	4.3E-01	No	NA	NA
Vinyl chloride	ND	NA	1.6E-01	No	NA	NA

Notes:

1. The greater the AF value, the lesser the degree of attenuation (reduction in concentration) from the subsurface to indoor air. For example, an AF calculated in this table greater than 1E-03 indicates less reduction in concentration from soil vapor to indoor air is required to meet the target indoor concentration at the site than is typically observed from soil vapor based on a groundwater source to indoor air in the USEPA vapor intrusion database.

[a] Highest concentration detected in the site monitoring well during last five years of groundwater monitoring.

[b] Maximum soil vapor concentration resulting from the maximum detected groundwater concentration assuming the vapor and aqueous phases are in local equilibrium according to Henry's Law.

[c] Most conservative (lowest) value of the noncancer and cancer screening levels calculated for the compound in Tables B-1 and B-2.

[d] The AF is the ratio of the indoor air concentration arising from vapor intrusion to the subsurface vapor concentration at a point or depth of interest in the vapor intrusion pathway. The AF indicates the degree of reduction in soil vapor concentration of a compound entering a building through vapor intrusion required to meet the target indoor air concentration.

[e] Groundwater screening levels based on compounds partitioning from across the water table to soil gas according to Henry's Law in Table 2C: Question 4 Generic Screening Levels and Summary Sheet in Subsurface Vapor Intrusion Guidance (USEPA, 2002) uses a soil gas to indoor air attenuation factor of 1E-03.

[f] 95th percentile of groundwater-to-indoor air AFs based on 1,058 groundwater-to-indoor air AFs calculated from 266 buildings on 36 sites as described in USEPA's Vapor Intrusion Database: Preliminary Evaluation of Attenuation Factors (USEPA, 2008). The empirical groundwater-to-indoor air AFs were calculated by dividing measured indoor air concentrations by the soil vapor concentrations calculated from the estimated groundwater concentration underlying the building. The soil vapor concentrations were estimated by multiplying the estimated groundwater concentration by the compound's dimensionless Henry's law constant, as was done to calculate C_{source} in this table.

$C_{source} = H'_{TS} * C_W$ Calculated as shown in Table B-6. Reference: Equation 2 of *User's Guide for Evaluating Subsurface Vapor Intrusion into Buildings* (USEPA, 2004).
AF = Target Indoor Air Concentration/Csource.

AF = Vapor intrusion attenuation factor.
µg/m^3 = Microgram(s) per cubic meter.
µg/L = Microgram(s) per liter.
NA = Not applicable.
ND = Not detected.

TABLE B-15

EVALUATION OF VAPOR INTRUSION POTENTIAL OF COMPOUNDS FROM GROUNDWATER TO INDOOR AIR IN THE VICINITY OF MW-9B

Compound	MW-9B Maximum Groundwater Concentration (C_W) [a] (µg/L)	Maximum Source Soil Vapor Concentration(C_{source}) [b] (µg/m^3)	Target Indoor Air Concentration [c] (µg/m^3)	C_{source} > Target Indoor Air Concentration	AF to Achieve Target Indoor Air Concentration [d]	AF>1E-03 [e,f]
Benzene	ND	NA	3.1E-01	No	NA	NA
1,2-Dichlorobenzene	ND	NA	2.1E+02	No	NA	NA
1,1-Dichloroethene	9.14	6.98E+03	7.0E+01	Yes	1.0E-02	Yes
cis-1,2-Dichloroethene	981	1.08E+05	NA	NA	NA	NA
trans-1,2-Dichloroethene	23.46	6.18E+03	2.1E+01	Yes	3.4E-03	Yes
Tetrachloroethene	ND	NA	4.1E-01	No	NA	NA
Trichloroethene	4.84	1.29E+03	4.3E-01	Yes	3.4E-04	No
Vinyl chloride	24.2	2.08E+04	1.6E-01	Yes	7.7E-06	No

Notes:

1. The greater the AF value, the lesser the degree of attenuation (reduction in concentration) from the subsurface to indoor air. For example, an AF calculated in this table greater than 1E-03 indicates less reduction in concentration from soil vapor to indoor air is required to meet the target indoor concentration at the site than is typically observed from soil vapor based on a groundwater source to indoor air in the USEPA vapor intrusion database.

[a] Highest concentration detected in the site monitoring well during last five years of groundwater monitoring.

[b] Maximum soil vapor concentration resulting from the maximum detected groundwater concentration assuming the vapor and aqueous phases are in local equilibrium according to Henry's Law.

[c] Most conservative (lowest) value of the noncancer and cancer screening levels calculated for the compound in Tables B-1 and B-2.

[d] The AF is the ratio of the indoor air concentration arising from vapor intrusion to the subsurface vapor concentration at a point or depth of interest in the vapor intrusion pathway. The AF indicates the degree of reduction in soil vapor concentration of a compound entering a building through vapor intrusion required to meet the target indoor air concentration.

[e] Groundwater screening levels based on compounds partitioning from across the water table to soil gas according to Henry's Law in Table 2C: Question 4 Generic Screening Levels and Summary Sheet in Subsurface Vapor Intrusion Guidance (USEPA, 2002) uses a soil gas to indoor air attenuation factor of 1E-03.

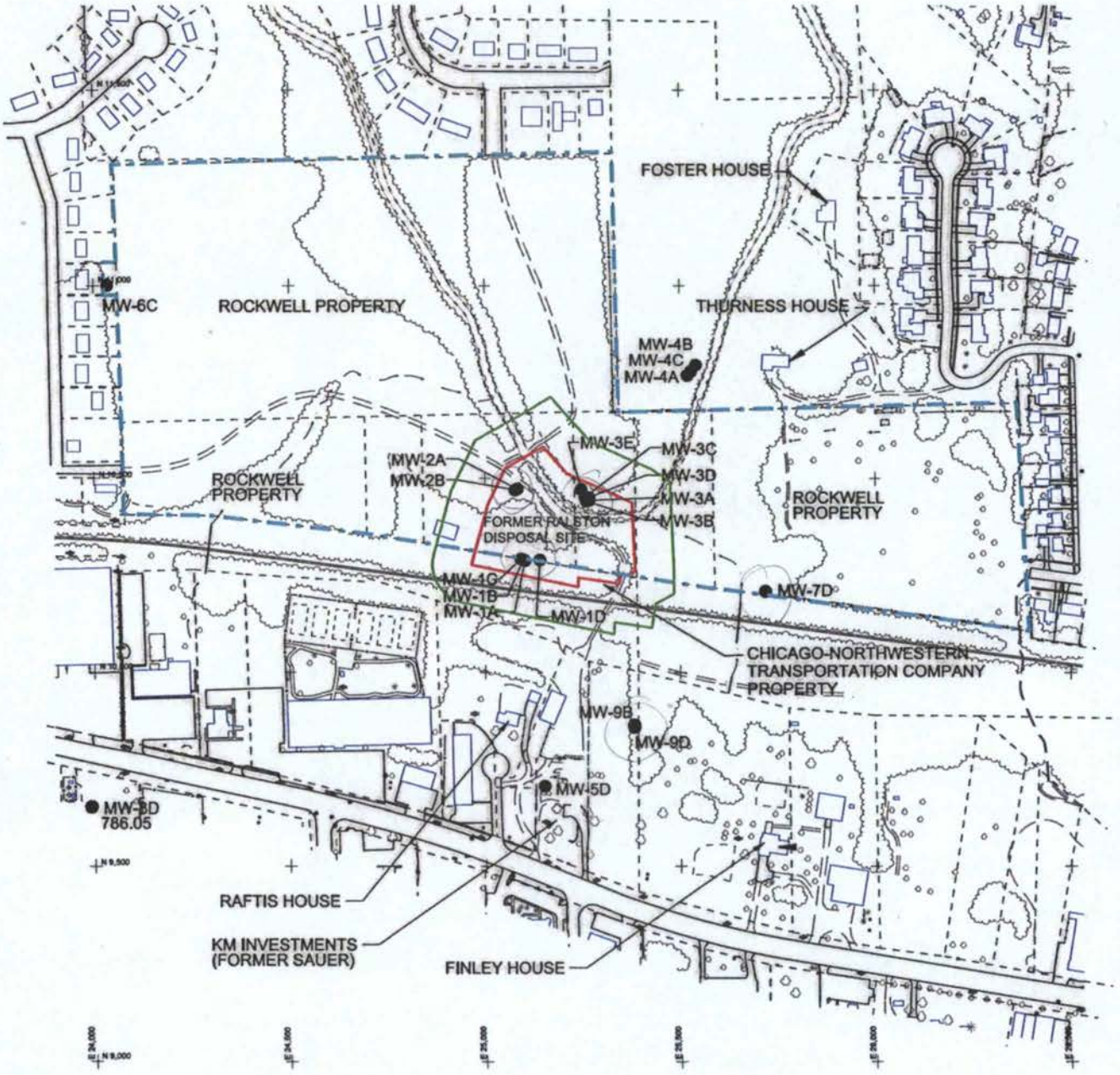
[f] 95th percentile of groundwater-to-indoor air AFs based on 1,058 groundwater-to-indoor air AFs calculated from 266 buildings on 36 sites as described in USEPA's Vapor Intrusion Database: Preliminary Evaluation of Attenuation Factors (USEPA, 2008). The empirical groundwater-to-indoor air AFs were calculated by dividing measured indoor air concentrations by the soil vapor concentrations calculated from the estimated groundwater concentration underlying the building. The soil vapor concentrations were estimated by multiplying the estimated groundwater concentration by the compound's dimensionless Henry's law constant, as was done to calculate C_{source} in this table.

$C_{source} = H'_{TS} * C_W$ Calculated as shown in Table B-6. Reference: Equation 2 of *User's Guide for Evaluating Subsurface Vapor Intrusion into Buildings* (USEPA, 2004).
AF = Target Indoor Air Concentration/Csource.

AF = Vapor intrusion attenuation factor.
µg/m^3 = Microgram(s) per cubic meter.
µg/L = Microgram(s) per liter.
NA = Not applicable.
ND = Not detected.

ATTACHMENT B
FIGURE

MWH



LEGEND:

- MONITORING WELL
- PROPERTY CONTROLED BY ROCKWELL COLLINS, INC.
- SITE BOUNDARY OF FORMAL DISPOSAL AREA
- 100-FOOT PERIMETER SURROUNDING SITE

DESIGNED BY	KARIN WILHELM	
DRAWN BY	NORA DAY	
CHECKED BY	STEVE VARSA	
APPROVED BY	-	
PROJECT MANAGER	STEVE VARSA	
CLIENT APPROVAL	-	
CLIENT REFERENCE NO.	-	

0 200 400
SCALE IN FEET

PROJECT LOCATION: DES MOINES, IOWA

PROJECT: ROCKWELL COLLINS, INC
CEDAR RAPIDS, IOWA

TITLE: SITE BOUNDARY AND PROPERTY OWNERSHIP

MWH

FIGURE: B-1

\\uswm1w02\projects\CAD\rockwell\Cedar Rapids\Ralston\SB&PO-2011.dgn

ATTACHMENT B1

MWH

Key: I = IRIS; P = PPRTV; A = ATSDR; C = Cal EPA; X = PPRTV Appendix; H = HEAST; J = New Jersey; O = EPA Office of Water; E = Environmental Criteria and Assessment Office; S = see user guide Section 5; L = see user guide on lead; M = mutagen; V = volatile; F = See FAQ; c = cancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; n = noncancer; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide); SSL values are based on DAF=1

Toxicity and Chemical-specific Information										Contaminant		Carcinogenic Target Risk (TR) = 1E-06				Noncancer Hazard Index (HI) = 1					Protection of	
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD_o (mg/kg-day)	key	RfC_i (mg/m^3)	key	voc	muta-gen	Analyte	CAS No.	Ingestion SL TR=1.0E-6 (ug/L)	Dermal SL TR=1.0E-6 (ug/L)	Inhalation SL TR=1.0E-6 (ug/L)	Carcinogenic SL TR=1.0E-6 (ug/L)	Ingestion SL HQ=1 (ug/L)	Dermal SL HQ=1 (ug/L)	Inhalation SL HQ=1 (ug/L)	Noncarcinogenic SL HI=1 (ug/L)	MCL (ug/L)	Risk-based SSL (mg/kg)	MCL-based SSL (mg/kg)
1.8E-02	C	5.1E-06	C	1.5E-01	I					ALAR	1596-84-5	3.7E+00	1.1E+04		3.7E+00	2.3E+03	7.1E+06		2.3E+03		8.2E-04	
8.7E-03	I			4.0E-03	I					Acephate	30560-19-1	7.7E+00	1.0E+04		7.7E+00	6.3E+01	8.1E+04		6.3E+01		1.7E-03	
		2.2E-06	I			9.0E-03	I	V		Acetaldehyde	75-07-0			2.2E+00	2.2E+00			1.9E+01	1.9E+01		4.5E-04	
				2.0E-02	I					Acetochlor	34256-82-1					3.1E+02	2.1E+03		2.7E+02		2.2E-01	
				9.0E-01	I	3.1E+01	A	V		Acetone	67-64-1					1.4E+04	2.9E+06	6.4E+04	1.2E+04		2.4E+00	
				3.0E-03	P	6.0E-02	P	V		Acetone Cyanohydrin	75-86-5					4.7E+01	8.8E+03	1.3E+02	3.4E+01		6.9E-03	
						6.0E-02	I	V		Acetonitrile	75-05-8							1.3E+02	1.3E+02		2.6E-02	
				1.0E-01	I			V		Acetophenone	98-86-2					1.6E+03	3.3E+04		1.5E+03		4.5E-01	
3.8E+00	C	1.3E-03	C							Acetylaminofluorene, 2-	53-96-3	1.8E-02	6.8E-02		1.4E-02						6.5E-05	
				5.0E-04	I	2.0E-05	I	V		Acrolein	107-02-8					7.8E+00	1.1E+03	4.2E-02	4.1E-02		8.4E-06	
5.0E-01	I	1.0E-04	I	2.0E-03	I	6.0E-03	I		M	Acrylamide	79-06-1	4.3E-02	2.2E+01		4.3E-02	3.1E+01	1.4E+04		3.1E+01		9.1E-06	
				5.0E-01	I	1.0E-03	I			Acrylic Acid	79-10-7					7.8E+03	7.4E+05		7.7E+03		1.6E+00	
5.4E-01	I	6.8E-05	I	4.0E-02	A	2.0E-03	I	V		Acrylonitrile	107-13-1	1.2E-01	1.2E+01	7.2E-02	4.5E-02	6.3E+02	5.8E+04	4.2E+00	4.1E+00		9.8E-06	
						6.0E-03	P			Adiponitrile	111-69-3											
5.6E-02	C			1.0E-02	I					Alachlor	15972-60-8	1.2E+00	3.8E+00		9.1E-01	1.6E+02	4.9E+02		1.2E+02	2.0E+00	7.5E-04	1.6E-03
				1.0E-03	I					Aldicarb	116-06-3					1.6E+01	1.0E+03		1.5E+01		3.8E-03	
				1.0E-03	I					Aldicarb Sulfone	1646-88-4					1.6E+01	1.7E+04		1.6E+01		3.4E-03	
1.7E+01	I	4.9E-03	I	3.0E-05	I					Aldrin	309-00-2	4.0E-03	2.2E-04		2.1E-04	4.7E-01	2.6E-02		2.4E-02		3.4E-05	
				2.5E-01	I					Ally	74223-64-6					3.9E+03	1.7E+05		3.8E+03		1.5E+00	
				5.0E-03	I	1.0E-04	X			Allyl Alcohol	107-18-6					7.8E+01	8.6E+03		7.8E+01		1.6E-02	
2.1E-02	C	6.0E-06	C			1.0E-03	I	V		Allyl Chloride	107-05-1	3.2E+00	2.9E+01	8.1E-01	6.3E-01			2.1E+00	2.1E+00		2.0E-04	
				1.0E+00	P	5.0E-03	P			Aluminum	7429-90-5					1.6E+04	2.4E+06		1.6E+04		2.3E+04	
				4.0E-04	I					Aluminum Phosphide	20859-73-8					6.3E+00	9.5E+02		6.2E+00			
				3.0E-04	I					Amdro	67485-29-4					4.7E+00			4.7E+00		1.7E+03	
				9.0E-03	I					Ametryn	834-12-8					1.4E+02	6.9E+02		1.2E+02		1.2E-01	
2.1E+01	C	6.0E-03	C							Aminobiphenyl, 4-	92-67-1	3.2E-03	1.3E-02		2.6E-03						1.3E-05	
				8.0E-02	P					Aminophenol, m-	591-27-5					1.3E+03	2.0E+05		1.2E+03		4.7E-01	
				2.0E-02	P					Aminophenol, p-	123-30-8					3.1E+02	6.4E+04		3.1E+02		1.2E-01	
				2.5E-03	I					Amitraz	33089-61-1					3.9E+01	6.9E+00		5.9E+00		3.0E+00	
						1.0E-01	I			Ammonia	7664-41-7											
				2.0E-01	I					Ammonium Sulfamate	7773-06-0					3.1E+03	4.7E+05		3.1E+03			
5.7E-03	I	1.6E-06	C	7.0E-03	P	1.0E-03	I			Aniline	62-53-3	1.2E+01	5.9E+02		1.2E+01	1.1E+02	5.3E+03		1.1E+02		3.9E-03	
4.0E-02	P			2.0E-03	X					Anthraquinone, 9,10-	84-65-1	1.7E+00	4.3E+00		1.2E+00	3.1E+01	8.1E+01		2.3E+01		1.2E-02	
				4.0E-04	I					Antimony (metallic)	7440-36-0					6.3E+00	1.4E+02		6.0E+00	6.0E+00	2.7E-01	2.7E-01
				5.0E-04	H					Antimony Pentoxide	1314-60-9					7.8E+00	1.8E+02		7.5E+00			
				9.0E-04	H					Antimony Potassium Tartrate	11071-15-1					1.4E+01	3.2E+02		1.3E+01			
				4.0E-04	H					Antimony Tetroxide	1332-81-6					6.3E+00	1.4E+02		6.0E+00			
						2.0E-04	I			Antimony Trioxide	1309-64-4											
				1.3E-02	I					Apollo	74115-24-5					2.0E+02	1.5E+03		1.8E+02		1.1E+01	
2.5E-02	I	7.1E-06	I	5.0E-02	H					Aramite	140-57-8	2.7E+00			2.7E+00	7.8E+02			7.8E+02		3.0E-02	
1.5E+00	I	4.3E-03	I	3.0E-04	I	1.5E-05	C			Arsenic, Inorganic	7440-38-2	4.5E-02	8.3E+00		4.5E-02	4.7E+00	7.1E+02		4.7E+00	1.0E+01	1.3E-03	2.9E-01
				3.5E-06	C	5.0E-05	I			Arsine	7784-42-1					5.5E-02	8.3E+00		5.4E-02			
				9.0E-03	I					Assure	76578-14-8					1.4E+02	2.7E+02		9.3E+01		1.4E+00	
				5.0E-02	I					Asulam	3337-71-1					7.8E+02	5.7E+05		7.8E+02		2.0E-01	
2.3E-01	C			3.5E-02	I					Atrazine	1912-24-9	2.9E-01	2.3E+00		2.6E-01	5.5E+02	4.4E+03		4.9E+02	3.0E+00	1.7E-04	1.9E-03
8.8E-01	C	2.5E-04	C							Auramine	492-80-8	7.6E-02	5.4E-01		6.7E-02						6.1E-04	
				4.0E-04	I					Avermectin B1	65195-55-3					6.3E+00			6.3E+00		1.1E-01	
1.1E-01	I	3.1E-05	I					V		Azobenzene	103-33-3	6.1E-01	6.2E-01	1.6E-01	1.0E-01						8.0E-04	
				2.0E-01	I	5.0E-04	H			Barium	7440-39-3					3.1E+03	3.3E+04		2.9E+03	2.0E+03	1.2E+02	8.2E+01
				4.0E-03	I					Baygon	114-26-1					6.3E+01	2.6E+03		6.1E+01		2.0E-02	
				3.0E-02	I					Bayleton	43121-43-3					4.7E+02	4.9E+03		4.3E+02		3.4E-01	
				2.5E-02	I					Baythroid	68359-37-5					3.9E+02	1.1E+02		8.7E+01		2.3E+01	
				3.0E-01	I					Benefin	1861-40-1					4.7E+03	1.7E+03		1.2E+03		4.1E+01	
				5.0E-02	I					Benomyl	17804-35-2					7.8E+02	2.2E+04		7.5E+02		6.6E-01	
				3.0E-02	I					Bentazon	25057-89-0					4.7E+02	6.7E+03		4.4E+02		9.6E-02	
				1.0E-01	I			V		Benzaldehyde	100-52-7					1.6E+03	3.4E+04		1.5E+03		3.3E-01	
5.5E-02	I	7.8E-06	I	4.0E-03	I	3.0E-02	I	V		Benzene	71-43-2	1.2E+00	8.4E+00	6.2E-01	3.9E-01	6.3E+01	4.1E+02	6.3E+01	2.9E+01	5.0E+00	2.0E-04	2.6E-03
				2.0E-04	X					Benzenediamine-2-methyl sulfate, 1,4-	6369-59-1					3.1E+00			3.1E+00			
				1.0E-03	P			V		Benzenethiol	108-98-5					1.6E+01	7.3E+01		1.3E+01		8.6E-03	
2.3E+02	I	6.7E-02	I	3.0E-03	I				M	Benzidine	92-87-5	9.4E-05	4.6E-03		9.2E-05	4.7E+01	2.1E+03		4.6E+01		2.4E-07	
				4.0E+00	I					Benzoic Acid	65-85-0					6.3E+04	8.5E+05		5.8E+04		1.4E+01	
1.3E+01	I							V		Benzotrichloride	98-07-7	5.2E-03	5.1E-03		2.6E-03						5.6E-06	
				1.0E-01	P					Benzyl Alcohol	100-51-6					1.6E+03	6.3E+04		1.5E+03		3.7E-01	
1.7E-01	I	4.9E-05	C	2.0E-03	P	1.0E-03	P	V		Benzyl Chloride	100-44-7	4.0E-01	2.9E+00	9.9E-02	7.7E-02	3.1E+01	2.3E+02	2.1E+00	1.9E+00		8.4E-05	
		2.4E-03	I	2.0E-03	I	2.0E-05	I			Beryllium and compounds	7440-41-7					3.1E+01	3.3E+01		1.6E+01	4.0E+00	1.3E+01	3.2E+00

Key: I = IRIS; P = PPRTV; A = ATSDR; C = Cal EPA; X = PPRTV Appendix; H = HEAST; J = New Jersey; O = EPA Office of Water; E = Environmental Criteria and Assessment Office; S = see user guide Section 5; L = see user guide on lead; M = mutagen; V = volatile; F = See FAQ; c = cancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; n = noncancer; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide); SSL values are based on DAF=1

Toxicity and Chemical-specific information												Contaminant		Carcinogenic Target Risk (TR) = 1E-06				Noncancer Hazard Index (HI) = 1					Protection of	
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD_o (mg/kg-day)	key	RfC_i (mg/m^3)	key	volatile	mutagen	Analyte	CAS No.	Ingestion SL TR=1.0E-6 (ug/L)	Dermal SL TR=1.0E-6 (ug/L)	Inhalation SL TR=1.0E-6 (ug/L)	Carcinogenic SL TR=1.0E-6 (ug/L)	Ingestion SL HQ=1 (ug/L)	Dermal SL HQ=1 (ug/L)	Inhalation SL HQ=1 (ug/L)	Noncarcinogenic SL HI=1 (ug/L)	MCL (ug/L)	Risk-based SSL (mg/kg)	MCL-based SSL (mg/kg)
				1.0E-04	I					Bildrin	141-66-2					1.6E+00	7.8E+02		1.6E+00		3.6E-04	
				9.0E-03	P					Bifenox	42576-02-3					1.4E+02	1.6E+02		7.5E+01		5.7E-01	
				1.5E-02	I					Biphenthrin	82657-04-3					2.3E+02			2.3E+02		1.1E+03	
8.0E-03	X			5.0E-02	I	4.0E-04	X	V		Biphenyl, 1,1'-	92-52-4	8.4E+00	5.6E+00		3.3E+00	7.8E+02	5.2E+02	8.3E-01	8.3E-01		8.7E-03	
7.0E-02	H	1.0E-05	H	4.0E-02	I			V		Bis(2-chloro-1-methylethyl) ether	108-60-1	9.6E-01	7.0E+00	4.9E-01	3.1E-01	6.3E+02	4.6E+03		5.5E+02		1.1E-04	
				3.0E-03	P					Bis(2-chloroethoxy)methane	111-91-1					4.7E+01			4.7E+01		1.1E-02	
1.1E+00	I	3.3E-04	I					V		Bis(2-chloroethyl)ether	111-44-4	6.1E-02	2.3E+00	1.5E-02	1.2E-02						3.1E-06	
1.4E 02	I	2.4E-06	C	2.0E-02	I					Bis(2-ethylhexyl)phthalate	117-81-7	4.8E+00	7.2E-02		7.1E-02	3.1E+02	4.7E+00		4.6E+00	6.0E+00	1.7E-02	1.4E+00
2.2E+02	I	6.2E-02	I					V		Bis(chloromethyl)ether	542-88-1	3.1E-04	2.9E-02	7.8E-05	6 2E-05						1.5E-08	
				5.0E-02	I					Bisphenol A	80-05-7					7.8E+02	2.3E+03		5.8E+02		4.4E+01	
				2.0E-01	I	2.0E 02	H			Boron And Borates Only	7440-42-8					3.1E+03	4.7E+05		3.1E+03		9.9E+00	
				4.0E-02	C	1.3E-02	C			Boron Trifluoride	7637-07-2					6.3E+02	9 5E+04		6.2E+02			
7.0E-01	I			4.0E-03	I					Bromate	15541-45-4	9.6E-02	1.8E+01		9.6E-02	6 3E+01	9.5E+03		6.2E+01	1.0E+01	7.4E-04	7.7E-02
2.0E+00	X	6.0E-04	X					V		Bromo-2-chloroethane, 1-	107-04-0	3.4E-02		8.1E-03	6.5E-03						1.8E 06	
				8.0E-03	I	6.0E-02	I	V		Bromobenzene	108-86-1					1.3E+02	3.8E+02	1.3E+02	5.4E+01		3.6E-02	
						4.0E-02	X	V		Bromochloromethane	74-97-5							8.3E+01	8.3E+01		2.1E-02	
6.2E-02	J	3.7E-05	C	2.0E-02	J			V		Bromodichloromethane	75-27-4	1.1E+00	1 6E+01	1.3E-01	1.2E-01	3.1E+02	4.6E+03		2.9E+02	8.0E+01(F)	3.2E-05	2.2E-02
7.9E-03	I	1.1E-06	I	2.0E-02	I					Bromoform	75-25-2	8.5E+00	1.2E+02		7.9E+00	3.1E+02	4.4E+03		2 9E+02	8.0E+01(F)	2.1E-03	2.1E-02
				1.4E-03	I	5.0E-03	I	V		Bromomethane	74-83-9					2.2E+01	6.8E+02	1.0E+01	7.0E+00		1.8E-03	
				5.0E-03	H					Bromophos	2104-96-3					7.8E+01	3.9E+01		2.6E+01		1.1E-01	
				2.0E-02	I					Bromoxynil	1689-84-5					3.1E+02			3.1E+02		2.7E-01	
				2.0E-02	I					Bromoxynil Octanoate	1689-99-2					3.1E+02	1.5E+02		1.0E+02		8.7E-01	
3.4E+00	C	3.0E-05	I			2.0E-03	I	V		Butadiene, 1,3-	106-99-0	2.0E-02	1.4E-01	1.6E-01	1.6E-02			4.2E+00	4.2E+00		8.6E-06	
				1.0E-01	I					Butanol, N-	71-36-3					1.6E+03	6.6E+04		1.5E+03		3.2E-01	
1.9E-03	P			2.0E-01	I					Butyl Benzyl Phthlate	85-68-7	3.5E+01	2.3E+01		1 4E+01	3.1E+03	2.0E+03		1.2E+03		2.0E-01	
				2.0E+00	P	3.0E+01	P			Butyl alcohol, sec-	78-92-2					3.1E+04	2.0E+06		3.1E+04		6.3E+00	
				5.0E-02	I					Butylate	2008-41-5					7.8E+02	6.0E+02		3.4E+02		3.3E-01	
2.0E-04	C	5.7E-08	C							*Butylated hydroxyanisole*	25013-16-5	*3.4E+02*			*3.4E+02*						6.3E-01	
				5.0E-02	P			V		Butylbenzene, n-	104-51-8					7.8E+02			7.8E+02		2.5E+00	
				1.0E+00	I					Butylphthalyl Butylglycolate	85-70-1					1.6E+04			1.6E+04		3.5E+02	
				2.0E-02	A					Cacodylic Acid	75-60-5					3.1E+02			3.1E+02			
		1.8E-03	I	1.0E-03	I	2.0E-05	C			Cadmium (Diet)	7440-43-9											
		1.8E-03	I	5.0E-04	I	2.0E-05	C			Cadmium (Water)	7440-43-9					7.8E+00	5.9E+01		6.9E+00	5.0E+00	5.2E-01	3.8E-01
				5.0E-01	I					Caprolactam	105-60-2					7.8E+03	6.4E+05		7.7E+03		1.9E+00	
1.5E-01	C	4.3E-05	C	2.0E-03	I					Captafol	2425-06-1	4.5E-01	1.5E+00		3.5E-01	3.1E+01	1.1E+02		2.4E+01		6.1E-04	
2.3E-03	C	6.6E-07	C	1.3E-01	I					Captan	133-06-2	2.9E+01	3.0E+02		2.7E+01	2.0E+03	2.1E+04		1.9E+03		1.9E-02	
				1.0E-01	I					Carbaryl	63-25-2					1.6E+03	1.7E+04		1.4E+03		1.3E+00	
				5.0E-03	I					Carbofuran	1563-66-2					7.8E+01	1.0E+03		7.3E+01	4.0E+01	2.8E-02	1.6E-02
				1.0E-01	I	7.0E-01	I	V		Carbon Disulfide	75-15-0					1.6E-03	1.3E+04	1.5E+03	7.2E+02		2.1E-01	
7.0E-02	I	6.0E-06	I	4.0E-03	I	1.0E-01	I	V		Carbon Tetrachloride	56-23-5	9.6E-01	3.7E+00	8.1E-01	3.9E-01	6.3E+01	2.4E+02	2.1E+02	4.0E+01	5.0E+00	1.5E-04	1.9E-03
				1.0E-02	I					Carbosulfan	55285-14-8					1.6E+02			1.6E+02		3.8E+00	
				1.0E-01	I					Carboxin	5234-68-4					1.6E+03	2.9E+04		1.5E+03		8.0E-01	
						9 0E-04	I			Ceric oxide	1306-38-3											
				1.0E-01	I					Chloral Hydrate	302-17-0					1.6E+03	1.1E+05		1.5E+03		3.1E-01	
				1.5E-02	I					Chloramben	133-90-4					2.3E+02			2 3E+02		5.7E-02	
4.0E-01	H									Chloranil	118-75-2	1.7E-01			1.7E-01						1.4E-04	
3.5E-01	I	1.0E-04	I	5.0E-04	I	7.0E-04	I			Chlordane	12789-03-6	1.9E-01			1.9E-01	7.8E+00			7.8E+00	2.0E+00	1.3E-02	1.4E-01
1.0E+01	I	4.6E-03	C	3.0E-04	I					Chlordecone (Kepone)	143-50-0	6.7E-03	5.5E-03		3.0E-03	4.7E+00	3.8E+00		2.1E+00		1.1E-04	
				7.0E-04	A					Chlorfenvinphos	470-90-6					1.1E+01	4.0E+01		8.6E+00		2.3E-02	
				2.0E-02	I					Chlorimuron, Ethyl-	90982-32-4					3.1E+02	1.1E+04		3.0E+02		1.0E-01	
				1.0E-01	I	1.5E-04	A			Chlorine	7782-50-5					1.6E+03	2.4E+05		1.6E+03		7.0E-01	
				3.0E-02	I	2.0E-04	I			Chlorine Dioxide	10049-04-4					4.7E+02	7.1E+04		4.7E+02			
				3.0E-02	I					Chlorite (Sodium Salt)	7758-19-2					4.7E+02	7.1E+04		4.7E+02	1.0E+03		
						5.0E+01	I	V		Chloro-1,1-difluoroethane, 1-	75-68-3							1.0E+05	1.0E+05		5.2E+01	
		3.0E-04	I	2.0E-02	H	2.0E-02	I	V		Chloro-1,3-butadiene, 2-	126-99-8			1.6E-02	1.6E-02	3.1E+02	1.2E+03	4.2E+01	3.6E+01		8.5E-06	
4.6E-01	H									Chloro 2-methylaniline HCl, 4-	3165-93-3	1.5E-01	1.2E+00		1.3E-01						7.4E-05	
1.0E-01	P	7.7E-05	C	3.0E-03	X					Chloro-2-methylanilline, 4-	95-69-2	6.7E-01			6.7E-01	4.7E+01			4.7E+01		3.8E-04	
2.7E-01	X									Chloroacetaldehyde, 2-	107-20-0	2.5E-01	3.9E+01		2.5E-01						5.0E-05	
				2.0E-03	H					Chloroacetic Acid	79-11-8					3.1E+01	4.3E+03		3.1E+01	6.0E+01	6.3E-03	1.2E 02
						3.0E-05	I			Chloroacetophenone, 2-	532-27-4											
2.0E-01	P			4.0E-03	I					Chloroaniline, p-	106-47-8	3.4E-01	5.0E+00		3.7E-01	6.3E+01	9.4E+02		5.9E+01		1.3E-04	
				2.0E-02	I	5.0E-02	P	V		Chlorobenzene	108-90-7					3.1E+02	9.1E+02	1.0E+02	7.2E+01	1.0E+02	4.9E-02	6.8E-02
1.1E-01	C	3.1E-05	C	2.0E-02	I					Chlorobenzilate	510-15-6	6.1E-01	4.8E-01		2.7E-01	3.1E+02	2.5E+02		1.4E+02		8.8E-04	
				3.0E-02	X					Chlorobenzoic Acid, p-	74-11-3					4.7E+02	2.4E+03		3.9E+02		9 9E-02	
				3.0E-03	P	3.0E-01	P	V		*Chlorobenzotrifluoride, 4-*	98-56-6					4.7E+01	6.6E+01	6.3E+02	2.6E+01		9.3E-02	

Key: I = IRIS; P = PPRTV; A = ATSDR; C = Cal EPA; X = PPRTV Appendix; H = HEAST; J = New Jersey; O = EPA Office of Water; E = Environmental Criteria and Assessment Office; S = see user guide Section 5; L = see user guide on lead; M = mutagen; V = volatile; F = See FAQ; c = cancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; n = noncancer; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide); SSL values are based on DAF=1

Toxicity and Chemical-specific Information										Contaminant		Carcinogenic Target Risk (TR) = 1E-06				Noncancer Hazard Index (HI) = 1					Protection of	
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD_o (mg/kg-day)	key	RfC_i (mg/m^3)	key	volatile	muta-gen	Analyte	CAS No.	Ingestion SL TR=1.0E-6 (ug/L)	Dermal SL TR=1.0E-6 (ug/L)	Inhalation SL TR=1.0E-6 (ug/L)	Carcinogenic SL TR=1.0E-6 (ug/L)	Ingestion SL HQ=1 (ug/L)	Dermal SL HQ=1 (ug/L)	Inhalation SL HQ=1 (ug/L)	Noncarcinogenic SL HI=1 (ug/L)	MCL (ug/L)	Risk-based SSL (mg/kg)	MCL-based SSL (mg/kg)
				4.0E-02	P			V		Chlorobutane, 1-	109-69-3					6.3E+02	2.1E+03		4.8E+02		2.0E-01	
						5.0E+01	I	V		Chlorodifluoromethane	75-45-6							1.0E+05	1.0E+05		4.3E+01	
3.1E-02	C	2.3E-05	I	1.0E-02	I	9.8E-02	A	V		Chloroform	67-66-3	2.2E+00	2.5E+01	2.1E-01	1.9E-01	1.6E+02	1.8E+03	2.0E+02	8.4E+01	8.0E+01(F)	5.3E-05	2.2E-02
						9.0E-02	I	V		Chloromethane	74-87-3							1.9E+02	1.9E+02		4.9E-02	
2.4E+00	C	6.9E-04	C					V		Chloromethyl Methyl Ether	107-30-2	2.8E-02		7.1E-03	5.6E-03						1.2E-06	
				8.0E-02	I			V		Chloronaphthalene, Beta-	91-58-7					1.3E+03	9.9E+02		5.5E+02		2.9E+00	
3.0E-01	P			3.0E-03	P	1.0E-05	X			Chloronitrobenzene, o-	88-73-3	2.2E-01	2.2E+00		2.0E-01	4.7E+01	4.6E+02		4.3E+01		1.9E-04	
6.3E-03	P			1.0E-03	P	6.0E-04	P			Chloronitrobenzene, p-	100-00-5	1.1E+01	8.2E+01		9.4E+00	1.6E+01	1.2E+02		1.4E+01		8.7E-03	
				5.0E-03	I			V		Chlorophenol, 2-	95-57-8					7.8E+01	7.2E+02		7.1E+01		5.7E-02	
						4.0E-04	C	V		Chloropicrin	76-06-2							8.3E-01	8.3E-01		2.5E-04	
3.1E-03	C	8.9E-07	C	1.5E-02	I					Chlorothalonil	1897-45-6	2.2E+01	1.4E+02		1.9E+01	2.3E+02	1.5E+03		2.0E+02		4.3E-02	
				2.0E-02	I			V		Chlorotoluene, o-	95-49-8					3.1E+02	4.1E+02		1.8E+02		1.7E-01	
				2.0E-02	X			V		Chlorotoluene, p-	106-43-4					3.1E+02	4.7E+02		1.9E+02		1.8E-01	
2.4E+02	C	6.9E-02	C							Chlorozotocin	54749-90-5	2.8E-04	6.3E-01		2.8E-04						6.2E-08	
				2.0E-01	I					Chlorpropham	101-21-3					3.1E+03	7.0E+03		2.2E+03		1.9E+00	
				1.0E-03	A					Chlorpyrifos	2921-88-2					1.6E+01	1.0E+01		6.2E+00		9.2E-02	
				1.0E-02	H					Chlorpyrifos Methyl	5598-13-0					1.6E+02	2.1E+02		8.9E+01		4.1E-01	
				5.0E-02	I					Chlorsulfuron	64902-72-3					7.8E+02	4.0E+04		7.7E+02		6.5E-01	
				8.0E-04	H					Chlorthiophos	60238-56-4					1.3E+01	2.4E+00		2.0E+00		5.2E-02	
				1.5E+00	I					Chromium(III), Insoluble Salts	16065-83-1					2.3E+04	4.6E+04		1.6E+04		2.8E+07	
5.0E-01	J	8.4E-02	S	3.0E-03	I	1.0E-04	I		M	Chromium(VI)	18540-29-9	4.3E-02	1.1E-01		3.1E-02	4.7E+01	8.9E+01		3.1E+01		5.9E-04	
										Chromium, Total	7440-47-3									1.0E+02		1.8E+05
		9.0E-03	P	3.0E-04	P	6.0E-06	P			Cobalt	7440-48-4					4.7E+00	1.8E+03		4.7E+00		2.1E-01	
		6.2E-04	I						M	Coke Oven Emissions	8007-45-2											
				4.0E-02	H					Copper	7440-50-8					6.3E+02	9.5E+04		6.2E+02	1.3E+03	2.2E+01	4.6E+01
				5.0E-02	I	6.0E-01	C			Cresol, m-	108-39-4					7.8E+02	8.5E+03		7.2E+02		5.7E-01	
				5.0E-02	I	6.0E-01	C			Cresol, o-	95-48-7					7.8E+02	8.6E+03		7.2E+02		5.8E-01	
				5.0E-03	H	6.0E-01	C			Cresol, p-	106-44-5					7.8E+01	8.7E+02		7.2E+01		5.7E-02	
				1.0E-01	X					Cresol, p-chloro-m-	59-50-7					1.6E+03	3.7E+03		1.1E+03		1.3E+00	
				1.0E-01	A	6.0E-01	C	V		Cresols	1319-77-3					1.6E+03	1.7E+04	1.3E+03	6.7E+02		5.4E-01	
1.9E+00	H			1.0E-03	P			V		Crotonaldehyde, trans-	123-73-9	3.5E-02	2.3E+00		3.5E-02	1.6E+01	9.8E+02		1.5E+01		7.1E-06	
				1.0E-01	I	4.0E-01	I	V		Cumene	98-82-8					1.6E+03	1.4E+03	8.3E+02	3.9E+02		6.4E-01	
2.2E-01	C	6.3E-05	C							Cupferron	135-20-6	3.1E-01			3.1E-01						5.3E-04	
8.4E-01	H			2.0E-03	H					Cyanazine	21725-46-2	8.0E-02	1.4E+00		7.6E-02	3.1E+01	5.4E+02		3.0E+01		3.5E-05	
										Cyanides												
				4.0E-02	I					~Calcium Cyanide	592-01-8					6.3E+02	9.5E+04		6.2E+02			
				5.0E-03	I					~Copper Cyanide	544-92-3					7.8E+01	1.2E+04		7.8E+01			
				2.0E-02	I			V		~Cyanide (CN-)	57-12-5					3.1E+02	4.7E+04		3.1E+02	2.0E+02	3.1E+00	2.0E+00
				4.0E-02	I			V		~Cyanogen	460-19-5					6.3E+02	1.1E+05		6.2E+02			
				9.0E-02	I			V		~Cyanogen Bromide	506-68-3					1.4E+03	8.4E+05		1.4E+03			
				5.0E-02	I			V		~Cyanogen Chloride	506-77-4					7.8E+02	3.0E+05		7.8E+02			
				6.0E-04	I	8.0E-04	I	V		~Hydrogen Cyanide	74-90-8					9.4E+00	1.4E+03	1.7E+00	1.4E+00			
				5.0E-02	I					~Potassium Cyanide	151-50-8					7.8E+02	5.9E+04		7.7E+02			
				2.0E-01	I					~Potassium Silver Cyanide	506-61-6					3.1E+03	9.5E+03		2.4E+03			
				1.0E-01	I					~Silver Cyanide	506-64-9					1.6E+03	9.5E+03		1.3E+03			
				4.0E-02	I					~Sodium Cyanide	143-33-9					6.3E+02	9.5E+04		6.2E+02	2.0E+02		
				2.0E-04	P			V		~Thiocyanate	463-56-9					3.1E+00			3.1E+00		6.6E-04	
				5.0E-02	I					~Zinc Cyanide	557-21-1					7.8E+02	2.0E+05		7.8E+02			
						6.0E+00	I	V		Cyclohexane	110-82-7							1.3E+04	1.3E+04		1.3E+01	
2.3E-02	H									Cyclohexane, 1,2,3,4,5-pentabromo-6-chloro-	87-84-3	2.9E+00	7.1E+00		2.1E+00						1.2E-02	
				5.0E+00	I	7.0E-01	P			Cyclohexanone	108-94-1					7.8E+04	4.5E+06		7.7E+04		1.8E+01	
				2.0E-01	I					Cyclohexylamine	108-91-8					3.1E+03	6.4E+04		3.0E+03		7.9E-01	
				5.0E-03	I					Cyhalothrin/karate	68085-85-8					7.8E+01			7.8E+01		5.3E+01	
				1.0E-02	I					Cypermethrin	52315-07-8					1.6E+02			1.6E+02		2.5E+01	
				7.5E-03	I					Cyromazine	66215-27-8					1.2E+02			1.2E+02		3.0E-02	
2.4E-01	I	6.9E-05	C							DDD	72-54-8	2.8E-01			2.8E-01						6.6E-02	
3.4E-01	I	9.7E-05	C							DDE, p,p'-	72-55-9	2.0E-01			2.0E-01						4.6E-02	
3.4E-01	I	9.7E-05	I	5.0E-04	I					DDT	50-29-3	2.0E-01			2.0E-01	7.8E+00			7.8E+00		6.7E-02	
				1.0E-02	I					Dacthal	1861-32-1					1.6E+02	2.3E+02		9.3E+01		1.1E-01	
				3.0E-02	I					Dalapon	75-99-0					4.7E+02			4.7E+02	2.0E+02	9.7E-02	4.1E-02
7.0E-04	I			7.0E-03	I					Decabromodiphenyl ether, 2,2',3,3',4,4',5,5',6,6'- (BDE-209)	1163-19-5	9.6E+01			9.6E+01	1.1E+02			1.1E+02		5.3E+01	
				4.0E-05	I					Demeton	8065-48-3					6.3E-01	2.9E+00		5.2E-01			
1.2E-03	I			6.0E-01	I					Di[2-ethylhexyl]adipate	103-23-1	5.6E+01			5.6E+01	9.4E+03			9.4E+03	4.0E+02	4.0E+00	2.9E+01
6.1E-02	H									Diallate	2303-16-4	1.1E+00	7.9E-01		4.6E-01						6.8E-04	
				7.0E-04	A					Diazinon	333-41-5					1.1E+01	2.8E+01		7.9E+00		4.9E-02	

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Toxicity and Chemical-specific Information										Contaminant		Carcinogenic Target Risk (TR) = 1E-06				Noncancer Hazard Index (HI) = 1					Protection of	
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD_o (mg/kg-day)	key	RfC_i (mg/m^3)	key	volatile	muta-gen	Analyte	CAS No.	Ingestion SL TR=1.0E-6 (ug/L)	Dermal SL TR=1.0E-6 (ug/L)	Inhalation SL TR=1.0E-6 (ug/L)	Carcinogenic SL TR=1 0E-6 (ug/L)	Ingestion SL HQ=1 (ug/L)	Dermal SL HQ=1 (ug/L)	Inhalation SL HQ=1 (ug/L)	Noncarcinogenic SL HI=1 (ug/L)	MCL (ug/L)	Risk-based SSL (mg/kg)	MCL-based SSL (mg/kg)
8.0E-01	P	6.0E-03	P	2.0E-04	P	2.0E-04	I	V	M	Dibromo-3-chloropropane, 1,2-	96-12-8	2.7E-02	1.6E-01	3.2E-04	3.2E-04	3.1E+00	1.7E+01	4.2E-01	3.6E-01	2.0E-01	1.4E-07	8.6E-05
				1.0E-02	I					Dibromobenzene, 1,4-	106-37-6					1.6E+02	2.6E+02		9.8E+01		9.3E-02	
8.4E-02	I	2.7E-05	C	2.0E-02	I			V		Dibromochloromethane	124-48-1	8.0E-01	1 2E+01	1.8E-01	1.5E-01	3.1E+02	4.8E+03		2.9E+02	8.0E+01(F)	3.9E-05	2.1E-02
2.0E+00	I	6.0E-04	I	9.0E-03	I	9.0E-03	I	V		Dibromoethane, 1,2-	106-93-4	3.4E-02	6.1E-01	8.1E-03	6.5E-03	1.4E+02	2.5E+03	1.9E+01	1.6E+01	5.0E-02	1.8E-06	1.4E-05
				1.0E-02	H	4.0E-03	X	V		Dibromomethane (Methylene Bromide)	74-95-3					1.6E+02	3.9E+03	8.3E+00	7.9E+00		1.9E-03	
				1.0E-01	I					Dibutyl Phthalate	84-74-2					1.6E+03	1.2E+03		6.7E+02		1.7E+00	
				3.0E-04	P					Dibutyltin Compounds	NA					4.7E+00			4.7E+00			
				3.0E-02	I					Dicamba	1918-00-9					4.7E-02	7.2E+03		4.4E+02		1.1E-01	
		4.2E-03	P					V		Dichloro-2-butene, 1,4-	764-41-0			1.2E-03	1.2E-03						5.4E-07	
		4.2E-03	P					V		Dichloro-2-butene, cis-1,4-	1476-11-5			1.2E-03	1.2E-03						5.4E-07	
		4.2E-03	P					V		Dichloro-2-butene, trans-1,4-	110-57-6			1.2E-03	1.2E-03						5.4E-07	
5.0E-02	I			4.0E-03	I					Dichloroacetic Acid	79-43-6	1.3E+00	8.2E+01		1.3E+00	6.3E+01	3.8E+03		6.2E+01	6.0E+01	2.7E-04	1.2E-02
				9.0E-02	J	2.0E-01	H	V		Dichlorobenzene, 1,2-	95-50-1					1.4E+03	2.1E+03	4.2E+02	2.8E+02	6.0E+02	2.7E-01	5.8E-01
5.4E-03	C	1.1E-05	C	7.0E-02	A	8.0E-01	I	V		Dichlorobenzene, 1,4-	106-46-7	1.2E+01	1.8E+01	4.4E-01	4.2E-01	1.1E+03	1.6E+03	1.7E+03	4 7E+02	7.5E+01	4.0E-04	7.2E-02
4.5E-01	I	3.4E-04	C							Dichlorobenzidine, 3,3'-	91-94-1	1.5E-01	3.9E-01		1.1E-01						7.1E-04	
				9.0E-03	X					Dichlorobenzophenone, 4,4'-	90-98-2					1.4E+02			1.4E+02		8.5E-01	
				2.0E-01	I	1.0E-01	X	V		Dichlorodifluoromethane	75-71-8					3.1E+03	2.7E+04	2.1E+02	1.9E+02		3.0E-01	
5.7E-03	C	1.6E-06	C	2.0E-01	P			V		Dichloroethane, 1,1-	75-34-3	1.2E+01	1.6E+02	3.0E+00	2.4E+00	3.1E+03	4.0E+04		2.9E+03		6.8E-04	
9.1E-02	I	2.6E-05	I	6.0E-03	X	7.0E-03	P	V		Dichloroethane, 1,2-	107-06-2	7.4E-01	1.6E+01	1.9E-01	1.5E-01	9.4E+01	1.9E+03	1.5E+01	1.3E+01	5.0E+00	4.2E-05	1.4E-03
				5.0E-02	I	2.0E-01	I	V		Dichloroethylene, 1,1-	75-35 4					7.8E+02	5.9E+03	4.2E+02	2.6E+02	7.0E+00	9.3E-02	2.5E-03
				9.0E-03	H			V		Dichloroethylene, 1,2- (Mixed Isomers)	540-59-0					1.4E+02	1.1E+03		1.3E+02		3.7E-02	
				2.0E-03	I			V		Dichloroethylene, 1,2-cis-	156-59-2					3.1E+01	2.5E+02		2.8E+01	7.0E+01	8.2E-03	2.1E-02
				2.0E-02	I	6.0E-02	P	V		Dichloroethylene, 1,2-trans-	156-60-5					3.1E+02	2.5E+03	1.3E+02	8.6E+01	1.0E+02	2.5E-02	2.9E-02
				3.0E-03	I					Dichlorophenol, 2,4-	120-83-2					4.7E+01	1.3E+02		3.5E+01		4.1E-02	
				1.0E-02	I					Dichlorophenoxy Acetic Acid, 2,4-	94-75-7					1.6E+02	9.6E+02		1.3E+02	7.0E+01	3.5E-02	1.8E-02
				8.0E-03	I					Dichlorophenoxy]butyric Acid, 4-(2,4-	94-82-6					1.3E+02	3.4E+02		9.1E+01		3.6E-02	
3.6E-02	C	1.0E-05	C	9.0E-02	A	4.0E-03	I	V		Dichloropropane, 1,2-	78-87-5	1.9E+00	2.0E+01	4.9E-01	3.8E 01	1.4E+03	1.5E+04	8.3E+00	8.3E+00	5.0E+00	1.3E-04	1.7E-03
				2.0E-02	P			V		Dichloropropane, 1,3-	142-28-9					3.1E+02	3.3E+03		2.9E+02		9.9E-02	
				3.0E-03	I					Dichloropropanol, 2,3-	616-23-9					4.7E+01			4.7E+01		9.9E-03	
1 0E-01	I	4.0E-06	I	3.0E-02	I	2.0E-02	I	V		Dichloropropene, 1,3-	542-75-6	6.7E-01	6.7E+00	1.2E+00	4.1E-01	4.7E+02	4.7E+03	4.2E+01	3 8E+01		1.5E-04	
2.9E-01	I	8.3E-05	C	5.0E-04	I	5.0E-04	I			Dichlorvos	62-73-7	2.3E-01	1.2E+01		2.3E-01	7.8E+00	4.0E+02		7 7E+00		7.0E-05	
				8.0E-03	P	7.0E-03	P	V		Dicyclopentadiene	77-73-6					1.3E+02	2.5E+02	1.5E+01	1.2E+01		4.3E-02	
1.6E+01	I	4.6E-03	I	5.0E-05	I					Dieldrin	60-57-1	4.2E-03	2.3E-03		1.5E-03	7.8E-01	4.3E-01		2.8E-01		6.1E-05	
		3.0E-04	C			5.0E-03	I			Diesel Engine Exhaust	NA											
						3.0E-03	C			Diethanolamine	111-42-2											
				8.0E-01	I					Diethyl Phthalate	84-66-2					1.3E+04	1.4E+05		1.1E+04		4.7E+00	
				3.0E-02	P	1.0E-04	P			Diethylene Glycol Monobutyl Ether	112-34-5					4.7E+02	6.1E+04		4.7E+02		1.0E-01	
				6.0E-02	P	3.0E-04	P			Diethylene Glycol Monoethyl Ether	111-90-0					9.4E+02	5.5E+05		9 4E+02		1.9E-01	
				1.0E-03	P					Diethylformamide	617-84-5					1.6E+01			1.6E+01		3.2E-03	
3.5E+02	C	1 0E-01	C							Diethylstilbestrol	56-53-1	1.9E-04	5.6E-05		4.3E-05						2.4E-05	
				8.0E-02	I					Difenzoquat	43222-48-6					1.3E+03	5.2E+05		1 2E+03			
				2.0E-02	I					Diflubenzuron	35367-38-5					3.1E+02	7.4E+02		2 2E+02		2.5E-01	
						4.0E+01	I	V		Difluoroethane, 1,1-	75-37-6							8.3E+04	8.3E+04		2.8E+01	
4.4E-02	C	1.3E-05	C							Dihydrosafrole	94-58-6	1.5E+00			1.5E+00						1.9E-03	
						7.0E-01	P	V		Diisopropyl Ether	108-20-3							1.5E+03	1 5E+03		3.7E-01	
				8.0E 02	I			V		Diisopropyl Methylphosphonate	1445-75-6					1.3E+03	9.0E+04		1 2E+03		3.5E-01	
				2.0E-02	I					Dimethipin	55290-64-7					3.1E+02	1.7E+05		3.1E+02		6.9E-02	
				2.0E-04	I					Dimethoate	60-51-5					3.1E+00	4.5E+02		3.1E+00		7.0E-04	
1.4E-02	H									Dimethoxybenzidine, 3,3'-	119-90-4	4.8E+00	1.6E+02		4.7E+00						5.7E-03	
1.7E-03	P			6.0E-02	P					Dimethyl methylphosphonate	756-79-6	4.0E+01	2.4E+04		3.9E+01	9.4E+02	5.7E+05		9 4E+02		8.3E-03	
4.6E+00	C	1 3E-03	C							Dimethylamino azobenzene [p-]	60-11-7	1.5E-02	6.1E-03		4.3E-03						1.8E-05	
5.8E-01	H									Dimethylaniline HCl, 2,4-	21436-96-4	1.2E-01	2.1E+00		1.1E-01						6.2E-05	
2.0E-01	P			2.0E-03	X					Dimethylaniline, 2,4-	95-68-1	3.4E-01	6.1E+00		3.2E-01	3.1E+01	5.7E+02		3.0E+01		1.8E-04	
				2.0E-03	I			V		Dimethylaniline, N,N-	121-69-7					3.1E+01	2.2E+02		2.7E+01		9.8E-03	
1.1E+01	P									Dimethylbenzidine, 3,3'-	119-93-7	6.1E-03	7.2E-02		5.6E-03						3.7E-05	
				1.0E-01	P	3.0E-02	I			Dimethylformamide	68-12-2					1.6E+03	1.2E+06		1.6E+03		3.2E-01	
				1.0E-04	X	2.0E-06	X			Dimethylhydrazine, 1,1-	57-14-7					1.6E+00	1.4E+03		1.6E+00		3.5E-04	
5.5E+02	C	1.6E-01	C							Dimethylhydrazine, 1,2-	540-73-8	1.2E-04			1.2E-04						2.8E-08	
				2 0E-02	I					Dimethylphenol, 2,4-	105-67-9					3.1E+02	2.7E+03		2 7E+02		3 2E-01	
				6.0E-04	I					Dimethylphenol, 2,6-	576-26-1					9.4E+00	6.0E+01		8 1E+00		9.8E-03	
				1.0E-03	I					Dimethylphenol, 3,4-	95-65-8					1.6E+01	1.2E+02		1.4E+01		1.6E-02	
				1.0E 01	I			V		Dimethylterephthalate	120-61-6					1.6E+03	1.9E+04		1.4E+03		3.8E-01	
4.5E-02	C	1.3E-05	C							Dimethylvinylchloride	513-37-1	1.5E+00			1.5E+00						9.2E-04	
				8.0E-05	X					Dinitro-o-cresol, 4,6-	534-52-1					1.3E-00	1.9E+01		1.2E+00		2.0E-03	
				2.0E-03	I					Dinitro-o-cyclohexyl Phenol, 4,6-	131-89-5					3.1E+01	3.8E+01		1.7E+01		5.7E-01	

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Toxicity and Chemical-specific information												Contaminant		Carcinogenic Target Risk (TR) = 1E-06				Noncancer Hazard Index (HI) = 1					Protection of	
SFO (mg/kg-day)$^{-1}$	key	IUR (μg/m^3)$^{-1}$	key	RfD$_o$ (mg/kg-day)	key	RfC$_i$ (mg/m^3)	key	voc	muta-gen	Analyte	CAS No.	Ingestion SL TR=1.0E-6 (ug/L)	Dermal SL TR=1.0E-6 (ug/L)	Inhalation SL TR=1.0E-6 (ug/L)	Carcinogenic SL TR=1.0E-6 (ug/L)	Ingestion SL HQ=1 (ug/L)	Dermal SL HQ=1 (ug/L)	Inhalation SL HQ=1 (ug/L)	Noncarcinogenic SL HI=1 (ug/L)	MCL (ug/L)	Risk-based SSL (mg/kg)	MCL-based SSL (mg/kg)
				1.0E-04	P					Dinitrobenzene, 1,2-	528-29-0					1.6E+00	3.8E+01		1.5E+00		1.4E-03	
				1.0E-04	I					Dinitrobenzene, 1,3-	99-65-0					1.6E+00	5.2E+01		1.5E+00		1.4E-03	
				1.0E-04	P					Dinitrobenzene, 1,4-	100-25-4					1.6E+00	5.4E+01		1.5E+00		1.4E-03	
				2.0E-03	I					Dinitrophenol, 2,4-	51-28-5					3.1E+01	8.6E+02		3.0E+01		3.4E-02	
6.8E-01	I									Dinitrotoluene Mixture, 2,4/2,6-	25321-14-6	9.9E-02	1.2E+00		9.2E-02						1.3E-04	
3.1E-01	C	8.9E-05	C	2.0E-03	I					Dinitrotoluene, 2,4-	121-14-2	2.2E-01	3.7E+00		2.0E-01	3.1E+01	5.3E+02		3.0E+01		2.8E-04	
				1.0E-03	P					Dinitrotoluene, 2,6-	606-20-2					1.6E+01	2.2E+02		1.5E+01		2.0E-02	
				2.0E-03	S					Dinitrotoluene, 2-Amino-4,6-	35572-78-2					3.1E+01	7.3E+02		3.0E+01		2.3E-02	
				2.0E-03	S					Dinitrotoluene, 4-Amino-2,6-	19406-51-0					3.1E+01	7.3E+02		3.0E+01		2.3E-02	
				1.0E-03	I					Dinoseb	88-85-7					1.6E+01	3.8E+01		1.1E+01	7.0E+00	9.8E-02	6.2E-02
1.0E-01	I	7.7E-06	C	3.0E-02	I	3.0E+00	C			Dioxane, 1,4-	123-91-1	6.7E-01	1.9E+02		6.7E-01	4.7E+02	1.3E+05		4.7E+02		1.4E-04	
										Dioxins												
6.2E+03	I	1.3E+00	I							1,2,3,4,6,7,8-Hexachlorodibenzo-p-dioxin, Mixture	NA	1.1E-05			1.1E-05						1.5E-05	
1.3E+05	C	3.8E+01	C	1.0E-09	A	4.0E-08	C			2,3,7,8-TCDD, 2,3,7,8-	1746-01-6	5.2E-07			5.2E-07	1.6E-05			1.6E-05	3.0E-05	2.6E-07	1.5E-05
				3.0E-02	I					Diphenamid	957-51-7					4.7E+02			4.7E+02		4.6E+00	
				8.0E-04	X					Diphenyl Sulfone	127-63-9					1.3E+01	1.4E+02		1.1E+01		2.8E-02	
				2.5E-02	I					Diphenylamine	122-39-4					3.9E+02	6.0E+02		2.4E+02		4.4E-01	
8.0E-01	I	2.2E-04	I							Diphenylhydrazine, 1,2-	122-66-7	8.4E-02	3.3E-01		6.7E-02						2.2E-04	
				2.2E-03	I					Diquat	85-00-7					3.4E+01			3.4E+01	2.0E+01	6.5E-01	3.7E-01
7.4E+00	C	2.1E-03	C							Direct Black 38	1937-37-7	9.1E-03			9.1E-03						4.4E+00	
7.4E+00	C	2.1E-03	C							Direct Blue 6	2602-46-2	9.1E-03			9.1E-03						1.4E+01	
6.7E+00	C	1.9E-03	C							Direct Brown 95	16071-86-6	1.0E-02			1.0E-02							
				4.0E-05	I					Disulfoton	298-04-4					6.3E-01	9.5E-01		3.8E-01		7.1E-04	
				1.0E-02	I					Dithiane, 1,4-	505-29-3					1.6E+02	1.1E+04		1.5E+02		7.6E-02	
				2.0E-03	I					Diuron	330-54-1					3.1E+01	2.5E+02		2.8E+01		1.2E-02	
				4.0E-03	I					Dodine	2439-10-3					6.3E+01	7.5E+03		6.2E+01		3.2E-01	
				2.5E-02	I				V	EPTC	759-94-4					3.9E+02	1.1E+03		2.9E+02		1.5E-01	
				6.0E-03	I					Endosulfan	115-29-7					9.4E+01	4.5E+02		7.8E+01		1.1E+00	
				2.0E-02	I					Endothall	145-73-3					3.1E+02	6.1E+03		3.0E+02	1.0E+02	7.1E-02	2.4E-02
				3.0E-04	I					Endrin	72-20-8					4.7E+00	2.6E+00		1.7E+00	2.0E+00	6.8E-02	8.1E-02
9.9E-03	I	1.2E-06	I	6.0E-03	P	1.0E-03	I	V		Epichlorohydrin	106-89-8	6.8E+00	6.7E+02	4.1E+00	2.5E+00	9.4E+01	8.9E+03	2.1E+00	2.0E+00		4.5E-04	
						2.0E-02	I	V		Epoxybutane, 1,2-	106-88-7							4.2E+01	4.2E+01		9.2E-03	
				5.0E-03	I					Ethephon	16672-87-0					7.8E+01	3.0E+04		7.8E+01		1.6E-02	
				5.0E-04	I					Ethion	563-12-2					7.8E+00	5.4E+00		3.2E+00		6.3E-03	
				1.0E-01	P	6.0E-02	P			Ethoxyethanol Acetate, 2-	111-15-9					1.6E+03	1.6E+05		1.5E+03		3.2E-01	
				4.0E-01	H	2.0E-01	I			Ethoxyethanol, 2-	110-80-5					6.3E+03	1.9E-06		6.2E+03		1.3E+00	
				9.0E-01	I			V		Ethyl Acetate	141-78-6					1.4E+04	8.4E+05		1.4E+04		2.9E+00	
4.8E-02	H							V		Ethyl Acrylate	140-88-5	1.4E+00	3.8E+01		1.4E+00						3.0E-04	
						1.0E+01	I	V		Ethyl Chloride	75-00-3							2.1E+04	2.1E+04		5.9E+00	
				2.0E-01	I			V		Ethyl Ether	60-29-7					3.1E+03	1.3E+05		3.1E+03		6.8E-01	
				9.0E-02	H	3.0E-01	P	V		Ethyl Methacrylate	97-63-2					1.4E+03	1.6E+04	6.3E+02	4.2E+02		9.9E-02	
				1.0E-05	I					Ethyl-p-nitrophenyl Phosphonate	2104-64-5					1.6E-01	1.1E-01		6.6E-02		2.1E-03	
1.1E-02	C	2.5E-06	C	1.0E-01	I	1.0E+00	I	V		Ethylbenzene	100-41-4	6.1E+00	1.1E+01	1.9E+00	1.3E+00	1.6E+03	2.6E+03	2.1E+03	6.7E+02	7.0E+02	1.5E-03	7.8E-01
				3.0E-02	P					Ethylene Cyanohydrin	109-78-4					4.7E+02	3.1E+05		4.7E+02		9.5E-02	
				9.0E-02	P					Ethylene Diamine	107-15-3					1.4E+03			1.4E+03		3.2E-01	
				2.0E+00	I	4.0E-01	C			Ethylene Glycol	107-21-1					3.1E+04	3.7E+07		3.1E+04		6.3E+00	
				1.0E-01	I	1.6E+00	I			Ethylene Glycol Monobutyl Ether	111-76-2					1.6E+03	1.0E+05		1.5E+03		3.2E-01	
3.1E-01	C	8.8E-05	C			3.0E-02	C	V		Ethylene Oxide	75-21-8	2.2E-01	4.6E+01	5.5E-02	4.4E-02			6.3E+01	6.3E+01		9.1E-06	
4.5E-02	C	1.3E-05	C	8.0E-05	I					Ethylene Thiourea	96-45-7	1.5E+00	8.6E+02		1.5E+00	1.3E+00	7.0E+02		1.2E+00		2.8E-04	
6.5E+01	C	1.9E-02	C							Ethyleneimine	151-56-4	1.0E-03	2.1E-01		1.0E-03						2.2E-07	
				3.0E+00	I					Ethylphthalyl Ethyl Glycolate	84-72-0					4.7E+04	1.1E+06		4.5E+04		1.0E+02	
				8.0E-03	I					Express	101200-48-0					1.3E+02			1.3E+02		4.9E-02	
				2.5E-04	I					Fenamiphos	22224-92-6					3.9E+00	2.4E+01		3.4E+00		3.3E-03	
				2.5E-02	I					Fenpropathrin	39515-41-8					3.9E+02	5.2E+01		4.6E+01		2.1E+00	
				1.3E-02	I					Fluometuron	2164-17-2					2.0E+02	2.4E+03		1.9E+02		1.4E-01	
				4.0E-02	C	1.3E-02	C			Fluoride	16984-48-8					6.3E+02	9.5E+04		6.2E+02		9.3E+01	
				6.0E-02	I	1.3E-02	C			Fluorine (Soluble Fluoride)	7782-41-4					9.4E+02	1.4E+05		9.3E+02	4.0E+03	1.4E+02	6.0E+02
				8.0E-02	I					Fluridone	59756-60-4					1.3E+03	1.0E+04		1.1E+03		1.3E+02	
				2.0E-02	I					Flurprimidol	56425-91-3					3.1E+02	1.7E+03		2.6E+02		1.2E+00	
				6.0E-02	I					Flutolanil	66332-96-5					9.4E+02	3.2E+03		7.2E+02		3.9E+00	
				1.0E-02	I					Fluvalinate	69409-94-5					1.6E+02			1.6E+02		2.3E+02	
3.5E-03	I			1.0E-01	I					Folpet	133-07-3	1.9E+01	1.8E+02		1.7E+01	1.6E+03	1.5E+04		1.4E+03		4.1E-03	
1.9E-01	I									Fomesafen	72178-02-0	3.5E-01	7.7E+00		3.4E-01						1.1E-03	
				2.0E-03	I					Fonofos	944-22-9					3.1E+01	4.4E+01		1.8E+01		3.5E-02	
		1.3E-05	I	2.0E-01	I	9.8E-03	A			Formaldehyde	50-00-0					3.1E+03	2.0E+05		3.1E+03		6.2E-01	

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Toxicity and Chemical-specific Information											Contaminant		Carcinogenic Target Risk (TR) = 1E-06				Noncancer Hazard Index (HI) = 1					Protection of	
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD$_o$ (mg/kg-day)	key	RfC$_i$ (mg/m^3)	key	vol	muta-gen	Analyte	CAS No.	Ingestion SL TR=1.0E-6 (ug/L)	Dermal SL TR=1.0E-6 (ug/L)	Inhalation SL TR=1.0E-6 (ug/L)	Carcinogenic SL TR=1.0E-6 (ug/L)	Ingestion SL HQ=1 (ug/L)	Dermal SL HQ=1 (ug/L)	Inhalation SL HQ=1 (ug/L)	Noncarcinogenic SL HI=1 (ug/L)	MCL (ug/L)	Risk-based SSL (mg/kg)	MCL-based SSL (mg/kg)
				9.0E-01	P	3.0E-04	X			Formic Acid	64-18-6					1.4E+04	4.1E+06		1.4E+04		2.8E+00	
				3.0E+00	I					Fosetyl-Al	39148-24-8					4.7E+04			4.7E+04			
										Furans												
				1.0E-03	X			V		~Dibenzofuran	132-64-9					1.6E+01	9.2E+00		5.8E+00		1.1E-01	
				1.0E-03	I			V		~Furan	110-00-9					1.6E+01	3.1E+02		1.5E+01		5.7E-03	
3.8E+00	H									Furazolidone	67-45-8	1.8E-02	8.7E-00		1.8E-02						3.4E-05	
				3.0E-03	I	5.0E-02	H			Furfural	98-01-1					4.7E+01	4.9E+03		4.6E+01		9.9E-03	
1.5E+00	C	4.3E-04	C							Furium	531-82-8	4.5E-02	1.6E+00		4.4E-02						5.9E-05	
3.0E-02	I	8.6E-06	C							Furmecyclox	60568-05-0	2.2E+00	1.7E+00		9.6E-01						1.0E-03	
				4.0E-04	I					Glufosinate, Ammonium	77182-82-2					6.3E+00			6.3E+00		1.4E-03	
						8.0E-05	C			Glutaraldehyde	111-30-8											
				4.0E-04	I	1.0E-03	H			Glycidyl	765-34-4					6.3E+00			6.3E+00		1.3E-03	
				1.0E-01	I					Glyphosate	1071-83-6					1.6E+03			1.6E+03	7.0E+02	3.2E-01	1.4E-01
				3.0E-03	I					Goal	42874-03-3					4.7E+01	4.7E+01		2.4E+01		1.9E+00	
				3.0E-03	A	1.0E-02	A			Guthion	86-50-0					4.7E+01	5.9E+02		4.3E+01		1.3E-02	
				5.0E-05	I					Haloxyfop, Methyl	69806-40-2					7.8E-01	2.2E+00		5.8E-01		6.4E-03	
				1.3E-02	I					Harmony	79277-27-3					2.0E+02	2.5E+04		2.0E+02		6.1E-02	
4.5E+00	I	1.3E-03	I	5.0E-04	I					Heptachlor	76-44-8	1.5E-02	2.0E-03		1.8E-03	7.8E+00	1.0E+00		9.2E-01	4.0E-01	1.4E-04	3.3E-02
9.1E+00	I	2.6E-03	I	1.3E-05	I					Heptachlor Epoxide	1024-57-3	7.4E-03	6.1E-03		3.3E-03	2.0E 01	1.7E-01		9.2E-02	2.0E-01	6.8E-05	4.1E-03
				2.0E-03	I					Hexabromobenzene	87-82-1					3.1E+01			3.1E+01		1.8E-01	
				2.0E-04	J					*Hexabromodiphenyl ether, 2,2',4,4',5,5'- (BDE-153)*	*68631-49-2*					3.1E+00			3.1E+00			
1.6E+00	I	4.6E-04	I	8.0E-04	I					Hexachlorobenzene	118-74-1	4.2E-02			4.2E-02	1.3E+01			1.3E+01	1.0E+00	5.3E-04	1.3E-02
7.8E-02	I	2.2E-05	I	1.0E-03	P					Hexachlorobutadiene	87-68-3	8.6E-01	3.7E-01		2.6E-01	1.6E+01	6.8E+00		4.7E+00		5.0E-04	
6.3E+00	I	1.8E-03	I	8.0E-03	A					Hexachlorocyclohexane, Alpha-	319-84-6	1.1E-02	1.5E-02		6.2E-03	1.3E+02	1.7E+02		7.3E+01		3.6E-05	
1.8E+00	I	5.3E-04	I							Hexachlorocyclohexane, Beta-	319-85-7	3.7E-02	5.2E-02		2.2E-02						1.3E-04	
1.1E+00	C	3.1E-04	C	3.0E-04	I					Hexachlorocyclohexane, Gamma- (Lindane)	58-89-9	6.1E-02	8.5E-02		3.6E-02	4.7E+00	6.6E+00		2.7E+00	2.0E-01	2.1E-04	1.2E-03
1.8E+00	I	5.1E-04	I							Hexachlorocyclohexane, Technical	608-73-1	3.7E-02	5.2E-02		2.2E-02						1.3E-04	
				6.0E-03	I	2.0E-04	I			Hexachlorocyclopentadiene	77-47-4					9.4E+01	2.9E+01		2.2E+01	5 0E+01	7.0E-02	1.6E-01
4.0E-02	I	1.1E-05	C	7.0E-04	I	3.0E-02	I			Hexachloroethane	67-72-1	1.7E+00	1.5E+00		7.9E-01	1.1E+01	9.7E+00		5.1E+00		4.8E-04	
				3 0E-04	I					*Hexachlorophene*	*70-30-4*					*4.7E+00*			4.7E+00		6.3E+00	
1.1E-01	I			3 0E-03	I					Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	171-82-4	6.1E-01	7.3E+01		6.1E-01	4.7E+01	5.6E+03		4.7E+01		2.3E-04	
						1.0E-05	I	V		Hexamethylene Diisocyanate, 1,6-	822-06-0							2.1E-02	2.1E-02		2.1E-04	
				6.0E-02	H	7.0E-01	I	V		Hexane, N-	110-54-3					9.4E+02	4.5E+02	1.5E+03	2.5E+02		1.8E+00	
				2.0E+00	P					Hexanedioic Acid	124-04-9					3.1E+04	7.7E+06		3.1E+04		7.7E+00	
				5.0E-03	I	3.0E-02	I	V		Hexanone, 2-	591-78-6					7.8E+01	1.9E+03	6.3E+01	3.4E+01		7.9E-03	
				3.3E-02	I					Hexazinone	51235-04-2					5.2E+02	1.7E+04		5.0E+02		2.3E-01	
3 0E+00	I	4.9E-03	I			3.0E-05	P			Hydrazine	302-01-2	2.2E-02			2.2E-02							
3.0E+00	I	4.9E-03	I							Hydrazine Sulfate	10034-93-2	2.2E-02			2.2E-02							
						2.0E-02	I			Hydrogen Chloride	7647-01-0											
				4.0E-02	C	1.4E-02	C			Hydrogen Fluoride	7664-39-3					6.3E+02	9.5E+04		6.2E+02			
						2.0E-03	I			Hydrogen Sulfide	7783-06-4											
6.0E-02	P			4.0E-02	P					Hydroquinone	123-31-9	1.1E+00	1.0E+02		1.1E+00	6.3E+02	5.6E+04		6.2E+02		7.5E-04	
				1.3E-02	I					Imazalil	35554-44-0					2.0E+02	4.8E+02		1 4E+02		2.5E+00	
				2 5E-01	I					Imazaquin	81335-37-7					3.9E+03	1.8E+05		3 8E+03		1.9E+01	
				1.0E-02	A					Iodine	7553-56-2					1.6E+02	2.4E+04		1.6E+02		9.4E+00	
				4.0E-02	I					Iprodione	36734-19-7					6.3E+02	6.4E+03		5.7E+02		1.7E-01	
				7.0E-01	P					Iron	7439-89-6					1.1E+04	1.7E+06		1.1E+04		2.7E+02	
				3.0E-01	I			V		Isobutyl Alcohol	78-83-1					4.7E+03	2.4E+05		4.6E+03		9.5E-01	
9.5E-04	I			2.0E-01	I	2.0E+00	C			Isophorone	78-59-1	7.1E+01	1.4E+03		6.7E+01	3.1E+03	6.1E+04		3.0E+03		2.2E-02	
				1.5E-02	I					Isopropalin	33820-53-0					2.3E+02			2.3E+02		5.4E+00	
						7.0E+00	C			Isopropanol	67-63-0											
				1.0E-01	I					Isopropyl Methyl Phosphonic Acid	1832-54-8					1.6E+03	2.7E+05		1.6E+03		3.4E-01	
				5.0E-02	I					Isoxaben	82558-50-7					7.8E+02	1.9E+03		5.6E+02		1.5E+00	
						3.0E-01	A	V		IP-7	NA							6.3E+02	6.3E+02			
				7.5E-02	I					Kerb	23950-58-5					1.2E+03	3.9E+03		9.0E+02		9.1E-01	
				2.0E-03	I					Lactofen	77501-63-4					3.1E+01	4 7E+01		1.9E+01		8.7E-01	
										Lead Compounds												
2.8E-01	C	8.0E-05	C							~Lead acetate	301-04-2	2.4E-01			2 4E-01							
										~Lead and Compounds	7439-92-1									1.5E+01		1.4E+01
3.8E-02	C	1.1E-05	C							~Lead subacetate	1335-32-6	1.8E+00			1.8E+00							
				1.0E-07	I					~Tetraethyl Lead	78-00-2					1.6E-03	2.7E-03		9.9E-04		3.5E-06	
				2.0E-03	I					Linuron	330-55-2					3.1E+01	1.4E+02		2.6E+01		2.3E-02	
				2.0E-03	P					Lithium	7439-93-2					3.1E+01	4.7E+03		3.1E+01		9.3E+00	
				2.0E-01	I					Londax	83055-99-6					3.1E+03	1.7E+05		3.1E+03		7.9E-01	
				5.0E-04	I					MCPA	94-74-6					7.8E+00	2.1E+01		5.7E+00		1 5E-03	

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Toxicity and Chemical-specific information											Contaminant		Carcinogenic Target Risk (TR) = 1E-06				Noncancer Hazard Index (HI) = 1					Protection of	
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD$_o$ (mg/kg-day)	key	RfC, (mg/m^3)	key	vol	muta-gen	Analyte	CAS No.	Ingestion SL TR=1.0E-6 (ug/L)	Dermal SL TR=1.0E-6 (ug/L)	Inhalation SL TR=1.0E-6 (ug/L)	Carcinogenic SL TR=1.0E-6 (ug/L)	Ingestion SL HQ=1 (ug/L)	Dermal SL HQ=1 (ug/L)	Inhalation SL HQ=1 (ug/L)	Noncarcinogenic SL HI=1 (ug/L)	MCL (ug/L)	Risk-based SSL (mg/kg)	MCL-based SSL (mg/kg)
				1.0E-02	I					MCPB	94-81-5					1.6E+02			1.6E+02		6.2E-02	
				1.0E-03	I					MCPP	93-65-2					1.6E+01	5.1E+01		1.2E+01		3.5E-03	
				2.0E-02	I					Malathion	121-75-5					3.1E+02	7.7E+03		3.0E+02		7.9E-02	
				1.0E-01	I	7.0E-04	C			Maleic Anhydride	108-31-6					1.6E+03	2.6E+04		1.5E+03		3.0E-01	
				5.0E-01	I					Maleic Hydrazide	123-33-1					7.8E+03	6.3E+06		7.8E+03		1.6E+00	
				1.0E-04	P					Malononitrile	109-77-3					1.6E+00	6.0E+02		1.6E+00		3.2E-04	
				3.0E-02	H					Mancozeb	8018-01-7					4.7E+02	7.8E+04		4.7E+02		6.6E-01	
				5.0E-03	I					Maneb	12427-38-2					7.8E+01			7.8E+01		1.1E-01	
				1.4E-01	I	5.0E-05	I			Manganese (Diet)	7439-96-5											
				2.4E-02	S	5.0E-05	I			Manganese (Non-diet)	7439-96-5					3.8E+02	2.3E+03		3.2E+02		2.1E+01	
				9.0E-05	H					Mephosfolan	950-10-7					1.4E+00	1.8E+02		1.4E+00		2.1E-03	
				3.0E-02	I					Mepiquat Chloride	24307-26-4					4.7E+02			4.7E+02		1.6E-01	
										Mercury Compounds												
				3.0E-04	I	3.0E-05	C			~Mercuric Chloride (and other Mercury salts)	7487-94-7					4.7E+00	5.0E-01		4.3E+00	2.0E+00		
						3.0E-04	I	V		~Mercury (elemental)	7439-97-6							6.3E-01	6.3E-01	2.0E+00	3.3E-02	1.0E-01
				1.0E-04	I					~Methyl Mercury	22967-92-6					1.6E+00	2.4E+02		1.6E+00			
				8.0E-05	I					~Phenylmercuric Acetate	62-38-4					1.3E+00	4.0E+02		1.2E+00		3.9E-04	
				3.0E-05	I					Merphos	150-50-5					4.7E-01			4.7E-01		4.6E-02	
				3.0E-05	I					Merphos Oxide	78-48-8					4.7E-01	7.0E-02		6.1E-02		3.0E-04	
				6.0E-02	I					Metalaxyl	57837-19-1					9.4E+02	4.5E+04		9.2E+02		2.5E-01	
				1.0E-04	I	7.0E-04	H	V		Methacrylonitrile	126-98-7					1.6E+00	8.5E+01	1.5E+00	7.5E-01		1.7E-04	
				5.0E-05	I					Methamidophos	10265-92-6					7.8E-01	7.2E+02		7.8E-01		1.6E-04	
				5.0E-01	I	4.0E+00	C			Methanol	67-56-1					7.8E+03	2.8E+06		7.8E+03		1.6E+00	
				1.0E-03	I					Methidathion	950-37-8					1.6E+01	4.1E+02		1.5E+01		3.7E-03	
				2.5E-02	I					Methomyl	16752-77-5					3.9E+02	4.8E+04		3.9E+02		8.5E-02	
4.9E-02	C	1.4E-05	C							Methoxy-5-nitroaniline, 2-	99-59-2	1.4E+00	4.6E+01		1.3E+00						4.6E-04	
				5.0E-03	I					Methoxychlor	72-43-5					7.8E+01	4.2E+01		2.7E+01	4.0E+01	1.5E+00	2.2E+00
				8.0E-03	P	1.0E-03	P			Methoxyethanol Acetate, 2-	110-49-6					1.3E+02			1.3E+02		2.6E-02	
				5.0E-03	P	2.0E-02	I			Methoxyethanol, 2-	109-86-4					7.8E+01	4.2E+04		7.8E+01		1.6E-02	
				1.0E+00	X			V		Methyl Acetate	79-20-9					1.6E+04	1.9E+06		1.6E+04		3.2E+00	
				3.0E-02	H			V		Methyl Acrylate	96-33-3					4.7E+02	2.5E+04		4.6E+02		9.8E-02	
				6.0E-01	I	5.0E+00	I	V		Methyl Ethyl Ketone (2-Butanone)	78-93-3					9.4E+03	9.7E+05	1.0E+04	4.9E+03		1.0E+00	
		1.0E-03	X	1.0E-03	P	2.0E-05	X			Methyl Hydrazine	60-34-4					1.6E+01	9.9E+03		1.6E+01		3.5E-03	
				8.0E-02	H	3.0E+00	I	V		Methyl Isobutyl Ketone (4-methyl-2-pentanone)	108-10-1					1.3E+03	3.4E+04	6.3E+03	1.0E+03		2.3E-01	
						1.0E-03	C			Methyl Isocyanate	624-83-9											
				1.4E+00	I	7.0E-01	I	V		Methyl Methacrylate	80-62-6					2.2E+04	5.3E+05	1.5E+03	1.4E+03		3.0E-01	
				2.5E-04	I					Methyl Parathion	298-00-0					3.9E+00	2.9E+01		3.4E+00		5.7E-03	
				6.0E-02	X					Methyl Phosphonic Acid	993-13-5					9.4E+02			9.4E+02		1.9E-01	
				6.0E-03	H	4.0E-02	H	V		Methyl Styrene (Mixed Isomers)	25013-15-4					9.4E+01	1.1E+02	8.3E+01	3.1E+01		5.0E-02	
9.9E-02	C	2.8E-05	C							Methyl methanesulfonate	66-27-3	6.8E-01			6.8E-01						1.4E-04	
1.8E-03	C	2.6E-07	C			3.0E+00	I	V		Methyl tert-Butyl Ether (MTBE)	1634-04-4	3.7E+01	1.7E+03	1.9E+01	1.2E+01			6.3E+03	6.3E+03		2.8E-03	
				2.0E-04	X					Methyl-1,4-benzenediamine dihydrochloride, 2-	615-45-2					3.1E+00	2.8E+04		3.1E+00		1.9E-03	
9.0E-03	P			2.0E-02	X					Methyl-5-Nitroaniline, 2-	99-55-8	7.5E+00	1.2E+02		7.0E+00	3.1E+02	5.2E+03		2.9E+02		3.9E-03	
8.3E+00	C	2.4E-03	C							Methyl N-nitro-N-nitrosoguanidine, N-	70-25-7	8.1E-03			8.1E-03						2.8E-06	
1.3E-01	C	3.7E-05	C							Methylaniline Hydrochloride, 2-	636-21-5	5.2E-01	1.5E+01		5.0E-01						2.1E-04	
				1.0E-02	A					Methylarsonic acid	124-58-3					1.6E+02			1.6E+02			
				2.0E-04	X					Methylbenzene,1-4-diamine monohydrochloride, 2-	74612-12-7					3.1E+00			3.1E+00			
				2.0E-04	X					Methylbenzene-1,4-diamine sulfate, 2-	615-50-9					3.1E+00			3.1E+00			
2.2E+01	C	6.3E-03	C						M	Methylcholanthrene, 3-	56-49-5	9.8E-04			9.8E-04						1.9E-03	
7.5E-03	I	4.7E-07	I	6.0E-02	I	1.0E+00	A	V		Methylene Chloride	75-09-2	9.0E+00	2.5E+02	1.0E+01	4.7E+00	9.4E+02	2.5E+04	2.2E+03	6.4E+02	5.0E+00	1.2E-03	1.3E-03
1.0E-01	P	4.3E-04	C	2.0E-03	P				M	Methylene-bis(2-chloroaniline), 4,4'-	101-14-4	2.2E-01	4.0E-01		1.4E-01	3.1E+01	5.3E+01		2.0E+01		1.6E-03	
4.6E-02	I	1.3E-05	C							Methylene-bis(N,N-dimethyl) Aniline, 4,4'-	101-61-1	1.5E+00	1.0E+00		6.0E-01						3.3E-03	
1.6E+00	C	4.6E-04	C			2.0E-02	C			Methylenebisbenzenamine, 4,4'-	101-77-9	4.2E-02	1.4E+00		4.1E-02						1.8E-04	
						6.0E-04	I			Methylenediphenyl Diisocyanate	101-68-8											
				7.0E-02	H			V		*Methylstyrene, Alpha-*	98-83-9					1.1E+03	1.2E+03		5.8E+02		9.3E-01	
				1.5E-01	I					Metolachlor	51218-45-2					2.3E+03	1.9E+04		2.1E+03		2.5E+00	
				2.5E-02	I					Metribuzin	21087-64-9					3.9E+02	1.3E+04		3.8E+02		1.2E-01	
				3.0E+00	P					Mineral oils	8012-95-1					4.7E+04			4.7E+04		1.9E+03	
1.8E+01	C	5.1E-03	C	2.0E-04	I					Mirex	2385-85-5	3.7E-03			3.7E-03	3.1E+00			3.1E+00		2.7E-03	
				2.0E-03	I					Molinate	2212-67-1					3.1E+01	8.4E+01		2.3E+01		1.3E-02	
				5.0E-03	I					Molybdenum	7439-98-7					7.8E+01	1.2E+04		7.8E+01		1.6E+00	
				1.0E-01	I					Monochloramine	10599-90-3					1.6E+03	2.4E+05		1.6E+03			
				2.0E-03	P					*Monomethylaniline*	*100-61-8*					*3.1E+01*	*5.3E+02*		*3.0E+01*		*1.1E-02*	
				3.0E-04	X					N,N'-Diphenyl-1,4-benzenediamine	74-31-7					4.7E+00	6.3E+00		2.7E+00		2.8E-01	
				2.0E-03	I					Naled	300-76-5					3.1E+01	4.8E+03		3.1E+01		1.4E-02	

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Toxicity and Chemical-specific Information										Contaminant		Carcinogenic Target Risk (TR) = 1E-06				Noncancer Hazard Index (HI) = 1					Protection of	
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD_o (mg/kg-day)	key	RfC_i (mg/m^3)	key	volatile	muta-gen	Analyte	CAS No.	Ingestion SL TR=1.0E-6 (ug/L)	Dermal SL TR=1.0E-6 (ug/L)	Inhalation SL TR=1.0E-6 (ug/L)	Carcinogenic SL TR=1.0E-6 (ug/L)	Ingestion SL HQ=1 (ug/L)	Dermal SL HQ=1 (ug/L)	Inhalation SL HQ=1 (ug/L)	Noncarcinogenic SL HI=1 (ug/L)	MCL (ug/L)	Risk-based SSL (mg/kg)	MCL-based SSL (mg/kg)
				3.0E-02	X	1.0E-01	P	V		Naphtha, High Flash Aromatic (HFAN)	64724-95-6					4.7E+02		2.1E+02	1.4E+02			
1.8E+00	C	0.0E+00	C							Naphthylamine, 2-	91-59-8	3.7E-02	3.1E-01		3.3E-02						1.7E-04	
				1.0E-01	I					Napropamide	15299-99-7					1.6E+03	6.4E+03		1.3E+03		8.3E+00	
				5.0E-02	C	5.0E-05	C			Nickel Carbonyl	13463-39-3					7.8E+02	4.7E+03		6.7E+02			
				5.0E-02	C	1.0E-04	C			Nickel Oxide	1313-99-1					7.8E+02	1.2E+05		7.8E+02			
		2.4E-04	I	5.0E-02	C	5.0E-05	C			Nickel Refinery Dust	NA					7.8E+02	2.4E+04		7.6E+02		1.1E+02	
		2.6E-04	C	2.0E-02	I	9.0E-05	A			Nickel Soluble Salts	7440-02-0					3.1E+02	9.5E+03		3.0E+02		2.0E+01	
1.7E+00	C	4.8E-04	I	5.0E-02	C	5.0E-05	C			Nickel Subsulfide	12035-72-2	4.0E-02	1.5E+00		3.9E-02	7.8E+02	2.4E+04		7.6E+02			
				1.6E+00	I					Nitrate	14797-55-8					2.5E+04	3.8E+06		2.5E+04	1.0E+04		
				1.0E-01	I					Nitrite	14797-65-0					1.6E+03	2.4E+05		1.6E+03	1.0E+03		
				1.0E-02	X	5.0E-05	X			*Nitroaniline, 2-*	88-74-4					1.6E+02	2.4E+03		1.5E+02		6.2E-02	
2.0E-02	P			4.0E-03	P	6.0E-03	P			Nitroaniline, 4-	100-01-6	3.4E+00	1.1E+02		3.3E+00	6.3E+01	2.0E+03		6.1E+01		1.4E-03	
		4.0E-05	I	2.0E-03	I	9.0E 03	I	V		Nitrobenzene	98-95-3			1.2E-01	1.2E-01	3.1E+01	4.4E+02	1.9E+01	1.1E+01		7.9E-05	
				3.0E+03	P					Nitrocellulose	9004-70-0					4.7E+07			4.7E+07		1.0E+04	
				7.0E-02	H					Nitrofurantoin	67-20-9					1.1E+03	1.1E+06		1.1E+03		4.7E-01	
1.3E+00	C	3.7E-04	C							Nitrofurazone	59-87-0	5.2E-02	1.4E+01		5.2E-02						4.6E-05	
1.7E-02	P			1.0E-04	P					Nitroglycerin	55-63-0	4.0E+00	1.6E+02		3.9E+00	1.6E+00	6.2E+01		1.5E+00		6.6E-04	
				1.0E-01	I					Nitroguanidine	556-88-7					1.6E+03	1.3E+06		1.6E+03		3.8E-01	
		9.0E-06	P			2.0E-02	P	V		Nitromethane	75-52-5			5.4E-01	5.4E-01			4.2E+01	4.2E+01		1.2E-04	
		2.7E-03	H			2.0E-02	I	V		Nitropropane, 2-	79-46-9			1.8E-03	1.8E-03			4.2E+01	4.2E+01		4.7E-07	
2.7E+01	C	7.7E-03	C						M	Nitroso-N-ethylurea, N-	759-73-9	8.0E-04	1.4E-01		7.9E-04						1.9E-07	
1.2E+02	C	3.4E-02	C						M	Nitroso-N-methylurea, N-	684-93-5	1.8E-04	4.3E-02		1.8E-04						4.0E-08	
5.4E+00	I	1.6E-03	I					V		Nitroso-di-N-butylamine, N-	924-16-3	1.2E-02	6.7E-02	3.0E-03	2.4E-03						4.8E-06	
7.0E+00	I	2.0E-03	C							Nitroso-di-N-propylamine, N-	621-64-7	9.6E-03	3.0E-01		9.3E-03						7.0E-06	
2.8E+00	I	8.0E-04	C							Nitrosodiethanolamine, N-	1116-54-7	2.4E-02	4.4E+01		2.4E-02						4.8E-06	
1.5E+02	I	4.3E-02	I						M	Nitrosodiethylamine, N-	55-18-5	1.4E-04	1.6E-02		1.4E-04						5.2E-08	
5.1E+01	I	1.4E-02	I	8.0E-06	P	4.0E-05	X		M	Nitrosodimethylamine, N-	62-75-9	4.2E-04	1.9E-01		4.2E-04	1.3E-01	4.9E+01		1.2E-01		1.0E-07	
4.9E-03	I	2.6E-06	C							Nitrosodiphenylamine, N-	86-30-6	1.4E+01	4.4E+01		1.0E+01						5.7E-02	
2.2E+01	I	6.3E-03	C							Nitrosomethylethylamine, N-	10595-95-6	3.1E-03	5.5E-01		3.0E-03						8.7E-07	
6.7E+00	C	1.9E-03	C							Nitrosomorpholine [N-]	59-89-2	1.0E-02	4.5E+00		1.0E-02						2.5E-06	
9.4E+00	C	2.7E-03	C							Nitrosopiperidine [N-]	100-75-4	7.2E-03	9.3E-01		7.1E-03						3.8E-06	
2.1E+00	I	6.1E-04	I							Nitrosopyrrolidine, N-	930-55-2	3.2E-02	8.8E+00		3.2E-02						1.2E-05	
				1.0E 04	X					Nitrotoluene, m-	99-08-1					1.6E+00	9.7E+00		1.3E+00		1.2E-03	
2.2E-01	P			9.0E-04	P			V		Nitrotoluene, o-	88-72-2	3.1E-01	2.4E+00		2.7E-01	1.4E+01	1.1E+02		1.2E+01		2.5E-04	
1.6E-02	P			4.0E-03	P					Nitrotoluene, p-	99-99-0	4.2E+00	2.9E+01		3.7E+00	6.3E+01	4.4E+02		5.5E+01		3.4E-03	
				3.0E-04	X	2.0E-01	P	V		Nonane, n-	111-84-2					4.7E+00		4.2E+02	4.6E+00		6.6E-02	
				4.0E-02	I					Norflurazon	27314-13-2					6.3E+02	1.4E+04		6.0E+02		3.9E+00	
				7.0E-04	I					Nustar	85509-19-9					1.1E+01	3.5E+01		8.3E+00		1.4E+00	
				3.0E-03	I					Octabromodiphenyl Ether	32536-52-0					4.7E+01			4.7E+01		9.3E+00	
				5.0E-02	I					Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetra (HMX)	2691-41-0					7.8E+02	4.5E+05		7.8E+02		9.9E-01	
				2.0E-03	H					Octamethylpyrophosphoramide	152-16-9					3.1E+01			3.1E+01		7.5E-03	
				5.0E-02	I					Oryzalin	19044-88-3					7.8E+02	2.9E+03		6.2E+02		1.1E+00	
				5.0E-03	I					Oxadiazon	19666-30-9					7.8E+01	6.4E+01		3.5E+01		3.6E-01	
				2.5E 02	I					Oxamyl	23135-22-0					3.9E+02	3.6E+05		3.9E+02	2.0E+02	8.6E-02	4.4E-02
				1.3E-02	I					Paclobutrazol	76738-62-0					2.0E+02	1.2E+03		1.7E+02		3.6E-01	
				4.5E-03	I					Paraquat Dichloride	1910-42-5					7.0E+01	2.5E+06		7.0E+01		9.7E-01	
				6.0E-03	H					Parathion	56-38-2					9.4E+01	2.1E+02		6.5E+01		3.3E-01	
				5.0E-02	H					Pebulate	1114-71-2					7.8E+02	9.0E+02		4.2E+02		3.3E-01	
				4.0E-02	I					Pendimethalin	40487-42-1					6.3E+02	1.7E+02		1.3E+02		1.5E+00	
				2.0E-03	I					Pentabromodiphenyl Ether	32534-81-9					3.1E+01			3.1E+01		1.4E+00	
				1.0E-04	I					Pentabromodiphenyl ether, 2,2',4,4',5- (BDE-99)	60348-60-9					1.6E+00			1.6E+00		6.8E-02	
				8.0E-04	I					Pentachlorobenzene	608-93-5					1.3E+01	2.8E+00		2.3E+00		1.7E-02	
9.0E-02	P									Pentachloroethane	76-01-7	7.5E-01	2.2E+00		5.6E-01						2.7E-04	
2.6E-01	H			3.0E-03	I					Pentachloronitrobenzene	82-68-8	2.6E-01	1.7E-01		1.0E-01	4.7E+01	3.1E+01		1.9E+01		1.3E-03	
4.0E-01	I	5.1E-06	C	5.0E-03	I					Pentachlorophenol	87-86-5	1.7E-01			1.7E-01	7.8E+01			7.8E+01	1.0E+00	1.7E-03	1.0E-02
4.0E-03	X			2.0E-03	P					Pentaerythritol tetranitrate (PETN)	78-11-5	1.7E+01	3.7E+02		1.6E+01	3.1E+01	6.8E+02		3.0E+01		2.4E-02	
						1.0E+00	P	V		Pentane, n-	109-66-0							2.1E+03	2.1E+03		1.0E+01	
										Perchlorates												
				7.0E-04	I					~Ammonium Perchlorate	7790-98-9					1.1E+01	1.7E+03		1.1E+01			
				7.0E-04	I					~Lithium Perchlorate	7791-03-9					1.1E+01	1.7E+03		1.1E+01			
				7.0E-04	I					~Perchlorate and Perchlorate Salts	14797-73-0					1.1E+01	1.7E+03		1.1E+01	1.5E+01(F)		
				7.0E-04	I					~Potassium Perchlorate	7778-74-7					1.1E+01	8.3E+02		1.1E+01			
				7.0E-04	I					~Sodium Perchlorate	7601-89-0					1.1E+01	1.7E+03		1.1E+01			
				5.0E-02	I					Permethrin	52645-53-1					7.8E+02			7.8E+02		1.9E+02	
2.2E-03	C	6.3E-07	C							Phenacetin	62-44-2	3.1E+01	9.4E+02		3.0E+01						8.3E-03	

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Toxicity and Chemical-specific Information											Contaminant		Carcinogenic Target Risk (TR) = 1E-06				Noncancer Hazard Index (HI) = 1					Protection of	
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD_o (mg/kg-day)	key	RfC_i (mg/m^3)	key	vol	muta-gen	Analyte	CAS No.	Ingestion SL TR=1.0E-6 (ug/L)	Dermal SL TR=1.0E-6 (ug/L)	Inhalation SL TR=1.0E-6 (ug/L)	Carcinogenic SL TR=1.0E-6 (ug/L)	Ingestion SL HQ=1 (ug/L)	Dermal SL HQ=1 (ug/L)	Inhalation SL HQ=1 (ug/L)	Noncarcinogenic SL HI=1 (ug/L)	MCL (ug/L)	Risk-based SSL (mg/kg)	MCL-based SSL (mg/kg)
				2.5E-01	I					Phenmedipham	13684-63-4					3.9E+03	1.3E+04		3.0E+03		1.6E+01	
				3.0E-01	I	2.0E-01	C			Phenol	108-95-2					4.7E+03	9.6E+04		4.5E+03		2.6E+00	
				5.0E-04	X					Phenothiazine	92-84-2					7.8E+00	5.4E+00		3.2E+00		1.0E-02	
				6.0E-03	I					Phenylenediamine, m-	108-45-2					9.4E+01	3.4E+04		9.4E+01		2.5E-02	
4.7E-02	H									Phenylenediamine, o-	95-54-5	1.4E+00	2.5E+02		1.4E+00						3.8E-04	
				1.9E-01	H					Phenylenediamine, p-	106-50-3					3.0E+03	1.0E+06		3.0E+03		7.9E-01	
1.9E-03	H									Phenylphenol, 2-	90-43-7	3.5E+01	1.0E+02		2.6E+01						3.5E-01	
				2.0E-04	H					Phorate	298-02-2					3.1E+00	8.7E+00		2.3E+00		2.6E-03	
						3.0E-04	I	V		Phosgene	75-44-5											
				2.0E-02	I					Phosmet	732-11-6					3.1E+02	3.7E+03		2.9E+02		6.4E-02	
										Phosphates, Inorganic												
				4.9E+01	P					~Aluminum metaphosphate	13776-88-0					7.6E+05	1.2E+08		7.6E+05			
				4.9E+01	P					~Ammonium polyphosphate	68333-79-9					7.6E+05	1.2E+08		7.6E+05			
				4.9E+01	P					~Calcium pyrophosphate	7790-76-3					7.6E+05	1.2E+08		7.6E+05			
				4.9E+01	P					~Diammonium phosphate	7783-28-0					7.6E+05	1.2E+08		7.6E+05			
				4.9E+01	P					~Dicalcium phosphate	7757-93-9					7.6E+05	1.2E+08		7.6E+05			
				4.9E+01	P					~Dimagnesium phosphate	7782-75-4					7.6E+05	1.2E+08		7.6E+05			
				4.9E+01	P					~Dipotassium phosphate	7758-11-4					7.6E+05	1.2E+08		7.6E+05			
				4.9E+01	P					~Disodium phosphate	7558-79-4					7.6E+05	1.2E+08		7.6E+05			
				4.9E+01	P					~Monoaluminum phosphate	13530-50-2					7.6E+05	1.2E+08		7.6E+05			
				4.9E+01	P					~Monoammonium phosphate	7722-76-1					7.6E+05	1.2E+08		7.6E+05			
				4.9E+01	P					~Monocalcium phosphate	7758-23-8					7.6E+05	1.2E+08		7.6E+05			
				4.9E+01	P					~Monomagnesium phosphate	7757-86-0					7.6E+05	1.2E+08		7.6E+05			
				4.9E+01	P					~Monopotassium phosphate	7778-77-0					7.6E+05	1.2E+08		7.6E+05			
				4.9E+01	P					~Monosodium phosphate	7558-80-7					7.6E+05	1.2E+08		7.6E+05			
				4.9E+01	P					~Polyphosphoric acid	8017-16-1					7.6E+05	1.2E+08		7.6E+05			
				4.9E+01	P					~Potassium tripolyphosphate	13845-36-8					7.6E+05	1.2E+08		7.6E+05			
				4.9E+01	P					~Sodium acid pyrophosphate	7758-16-9					7.6E+05	1.2E+08		7.6E+05			
				4.9E+01	P					~Sodium aluminum phosphate (acidic)	7785-88-8					7.6E+05	1.2E+08		7.6E+05			
				4.9E+01	P					~Sodium aluminum phosphate (anhydrous)	10279-59-1					7.6E+05	1.2E+08		7.6E+05			
				4.9E+01	P					~Sodium aluminum phosphate (tetrahydrate)	10305-76-7					7.6E+05	1.2E+08		7.6E+05			
				4.9E+01	P					~Sodium hexametaphosphate	10124-56-8					7.6E+05	1.2E+08		7.6E+05			
				4.9E+01	P					~Sodium polyphosphate	68915-31-1					7.6E+05	1.2E+08		7.6E+05			
				4.9E+01	P					~Sodium trimetaphosphate	7785-84-4					7.6E+05	1.2E+08		7.6E+05			
				4.9E+01	P					~Sodium tripolyphosphate	7758-29-4					7.6E+05	1.2E+08		7.6E+05			
				4.9E+01	P					~Tetrapotassium phosphate	7320-34-5					7.6E+05	1.2E+08		7.6E+05			
				4.9E+01	P					~Tetrasodium pyrophosphate	7722-88-5					7.6E+05	1.2E+08		7.6E+05			
				4.9E+01	P					~Trialuminum sodium tetra decahydrogenoctaorthophosphate (dihydrate)	15136-87-5					7.6E+05	1.2E+08		7.6E+05			
				4.9E+01	P					~Tricalcium phosphate	7758-87-4					7.6E+05	1.2E+08		7.6E+05			
				4.9E+01	P					~Trimagnesium phosphate	7757-87-1					7.6E+05	1.2E+08		7.6E+05			
				4.9E+01	P					~Tripotassium phosphate	7778-53-2					7.6E+05	1.2E+08		7.6E+05			
				4.9E+01	P					~Trisodium phosphate	7601-54-9					7.6E+05	1.2E+08		7.6E+05			
				3.0E-04	I	3.0E-04	I			Phosphine	7803-51-2					4.7E+00	7.1E+02		4.7E+00			
				4.9E+01	P	1.0E-02	I			Phosphoric Acid	7664-38-2					7.6E+05	1.2E+08		7.6E+05			
				2.0E-05	I					Phosphorus, White	7723-14-0					3.1E-01	4.7E+01		3.1E-01		1.1E-03	
				1.0E+00	H					Phthalic Acid, P-	100-21-0					1.6E+04	2.3E+05		1.5E+04		5.3E+00	
				2.0E+00	I	2.0E-02	C			Phthalic Anhydride	85-44-9					3.1E+04	7.6E+05		3.0E+04		6.6E+00	
				7.0E-02	I					Picloram	1918-02-1					1.1E+03	3.1E+04		1.1E+03	5.0E+02	2.9E-01	1.4E-01
				1.0E-04	X					Picramic Acid (2-Amino-4,6-dinitrophenol)	96-91-3					1.6E+00	1.5E+02		1.5E+00		1.0E-03	
				1.0E-02	I					Pirimiphos, Methyl	29232-93-7					1.6E+02	2.2E+02		9.1E+01		8.7E-02	
3.0E+01	C	8.6E-03	C	7.0E-06	H					Polybrominated Biphenyls	59536-65-1	2.2E-03			2.2E-03	1.1E-01			1.1E-01			
										Polychlorinated Biphenyls (PCBs)												
7.0E-02	S	2.0E-05	S	7.0E-05	I					~Aroclor 1016	12674-11-2	9.6E-01			9.6E-01	1.1E+00			1.1E+00		9.2E-02	
2.0E+00	S	5.7E-04	S					V		~Aroclor 1221	11104-28-2	3.4E-02	1.2E-02	8.5E-03	4.3E-03						7.4E-05	
2.0E+00	S	5.7E-04	S					V		~Aroclor 1232	11141-16-5	3.4E-02	1.2E-02	8.5E-03	4.3E-03						7.4E-05	
2.0E+00	S	5.7E-04	S							~Aroclor 1242	53469-21-9	3.4E-02			3.4E-02						5.3E-03	
2.0E+00	S	5.7E-04	S							~Aroclor 1248	12672-29-6	3.4E-02			3.4E-02						5.2E-03	
2.0E+00	S	5.7E-04	S	2.0E-05	I					~Aroclor 1254	11097-69-1	3.4E-02			3.4E-02	3.1E-01			3.1E-01		8.8E-03	
2.0E+00	S	5.7E-04	S							~Aroclor 1260	11096-82-5	3.4E-02			3.4E-02						2.4E-02	
3.9E+00	E	1.1E-03	E	3.3E-05	E	1.3E-03	E			~Heptachlorobiphenyl, 2,3,3',4,4',5,5'- (PCB 189)	39635-31-9	1.7E-02			1.7E-02	5.2E-01			5.2E-01		1.2E-02	
3.9E+00	E	1.1E-03	E	3.3E-05	E	1.3E-03	E			~Hexachlorobiphenyl, 2,3',4,4',5,5'- (PCB 167)	52663-72-6	1.7E-02			1.7E-02	5.2E-01			5.2E-01		7.2E-03	
3.9E+00	E	1.1E-03	E	3.3E-05	E	1.3E-03	E			~Hexachlorobiphenyl, 2,3,3',4,4',5'- (PCB 157)	69782-90-7	1.7E-02			1.7E-02	5.2E-01			5.2E-01		7.4E-03	
3.9E+00	E	1.1E-03	E	3.3E-05	E	1.3E-03	E			~Hexachlorobiphenyl, 2,3,3',4,4',5- (PCB 156)	38380-08-4	1.7E-02			1.7E-02	5.2E-01			5.2E-01		7.4E-03	
3.9E+00	E	1.1E+00	E	3.3E-08	E	1.3E-06	E			~Hexachlorobiphenyl, 3,3',4,4',5,5'- (PCB 169)	32774-16-6	1.7E-05			1.7E-05	5.2E-04			5.2E-04		7.2E-06	
3.9E+00	E	1.1E-03	E	3.3E-05	E	1.3E-03	E			~Pentachlorobiphenyl, 2',3,4,4',5- (PCB 123)	65510-44-3	1.7E-02			1.7E-02	5.2E-01			5.2E-01		4.5E-03	

Key: I = IRIS; P = PPRTV; A = ATSDR; C = Cal EPA; X = PPRTV Appendix; H = HEAST; J = New Jersey; O = EPA Office of Water; E = Environmental Criteria and Assessment Office; S = see user guide Section 5; L = see user guide on lead; M = mutagen; V = volatile; F = See FAQ; c = cancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; n = noncancer; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide); SSL values are based on DAF=1

Toxicity and Chemical-specific Information									Contaminant		Carcinogenic Target Risk (TR) = 1E-06				Noncancer Hazard Index (HI) = 1					Protection of	
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD$_o$ (mg/kg-day)	key	RfC$_i$ (mg/m^3)	key	vol/cancer	mutagen	Analyte	CAS No.	Ingestion SL TR=1.0E-6 (ug/L)	Dermal SL TR=1.0E-6 (ug/L)	Inhalation SL TR=1.0E-6 (ug/L)	Carcinogenic SL TR=1.0E-6 (ug/L)	Ingestion SL HQ=1 (ug/L)	Dermal SL HQ=1 (ug/L)	Inhalation SL HQ=1 (ug/L)	Noncarcinogenic SL HI=1 (ug/L)	MCL (ug/L)	Risk-based SSL (mg/kg)	MCL-based SSL (mg/kg)
3.9E+00	E	1.1E-03	E	3.3E-05	E	1.3E-03	E			~Pentachlorobiphenyl, 2,3',4,4',5- (PCB 118)	31508-00-6	1.7E-02			1.7E-02	5.2E-01			5.2E-01		4.4E-03	
3.9E+00	E	1.1E-03	E	3.3E-05	E	1.3E-03	E			~Pentachlorobiphenyl, 2,3,3',4,4'- (PCB 105)	32598-14-4	1.7E-02			1.7E-02	5.2E-01			5.2E-01		4.5E-03	
3.9E+00	E	1.1E-03	E	3.3E-05	E	1.3E-03	E			~Pentachlorobiphenyl, 2,3,4,4',5- (PCB 114)	74472-37-0	1.7E-02			1.7E-02	5.2E-01			5.2E-01		4.5E-03	
1.3E+04	E	3.8E+00	E	1.0E-08	E	4.0E-07	E			~Pentachlorobiphenyl, 3,3',4,4',5- (PCB 126)	57465-28-8	5.2E-06			5.2E-06	1.6E-04			1.6E-04		1.3E-06	
2.0E+00	I	5.7E-04	I							~Polychlorinated Biphenyls (high risk)	1336-36-3											
4.0E-01	I	1.0E-04	I							~Polychlorinated Biphenyls (low risk)	1336-36-3	1.7E-01			1.7E-01					5.0E-01	2.6E-02	7.8E-02
7.0E-02	J	2.0E-05	I							~Polychlorinated Biphenyls (lowest risk)	1336-36-3											
1.3E+01	E	3.8E-03	E	1.0E-05	E	4.0E-04	E			~Tetrachlorobiphenyl, 3,3',4,4'- (PCB 77)	32598-13-3	5.2E-03			5.2E-03	1.6E-01			1.6E-01		8.1E-04	
3.9E+01	E	1.1E-02	E	3.3E-06	E	1.3E-04	E			~Tetrachlorobiphenyl, 3,4,4',5- (PCB 81)	70362-50-4	1.7E-03			1.7E-03	5.2E-02			5.2E-02		2.7E-04	
						6.0E-04	I			Polymeric Methylene Diphenyl Diisocyanate (PMDI)	9016-87-9											
										Polynuclear Aromatic Hydrocarbons (PAHs)												
				6.0E-02	I			V		~Acenaphthene	83-32-9					9.4E+02	6.8E+02		4.0E+02		4.1E+00	
				3.0E-01	I			V		~Anthracene	120-12-7					4.7E+03	1.8E+03		1.3E+03		4.2E+01	
7.3E-01	E	1.1E-04	C						M	~Benz[a]anthracene	56-55-3	2.9E-02			2.9E-02						1.0E-02	
1.2E+00	C	1.1E-04	C							~Benzo(j)fluoranthene	205-82-3	5.6E-02			5.6E-02						6.7E-02	
7.3E+00	I	1.1E-03	C						M	~Benzo[a]pyrene	50-32-8	2.9E-03			2.9E-03					2.0E-01	3.5E-03	2.4E 01
7.3E-01	E	1.1E-04	C						M	~Benzo[b]fluoranthene	205-99-2	2.9E-02			2.9E-02						3.5E-02	
7.3E-02	E	1.1E-04	C						M	~Benzo[k]fluoranthene	207-08-9	2.9E-01			2.9E-01						3.5E-01	
7.3E-03	E	1.1E-05	C						M	~Chrysene	218-01-9	2.9E+00			2.9E+00						1.1E+00	
7.3E+00	E	1.2E-03	C						M	~Dibenz[a,h]anthracene	53-70-3	2.9E-03			2.9E-03						1.1E-02	
1.2E+01	C	1.1E-03	C							~Dibenzo(a,e)pyrene	192-65-4	5.6E-03			5.6E-03						7.3E-02	
2.5E+02	C	7.1E-02	C						M	~Dimethylbenz(a)anthracene, 7,12-	57-97-6	8.6E-05			8.6E-05						8.5E-05	
				4.0E-02	I					~Fluoranthene	206-44-0					6.3E+02			6.3E+02		7.0E+01	
				4.0E-02	I			V		~Fluorene	86-73-7					6.3E+02	3.3E+02		2.2E+02		4.0E+00	
7.3E-01	E	1.1E-04	C						M	~Indeno[1,2,3-cd]pyrene	193-39-5	2.9E-02			2.9E-02						1.2E-01	
2.9E-02	P			7.0E-02	A			V		~Methylnaphthalene, 1-	90-12-0	2.3E+00	1.7E+00		9.7E-01	1.1E+03	7.9E+02		4.6E+02		5.1E-03	
				4.0E-03	I			V		~Methylnaphthalene, 2-	91-57-6					6.3E+01	4.6E+01		2.7E+01		1.4E-01	
		3.4E-05	C	2.0E-02	I	3.0E-03	I	V		~Naphthalene	91-20-3			1.4E-01	1.4E-01	3.1E+02	5.0E+02	6.3E+00	6.1E+00		4.7E-04	
1.2E+00	C	1.1E-04	C							~Nitropyrene, 4-	57835-92-4	5.6E-02	2.3E-02		1.6E-02						2.8E-03	
				3.0E-02	I			V		~Pyrene	129-00-0					4.7E+02	1.1E+02		8.7E+01		9.5E+00	
1.5E-01	I			9.0E-03	I					Prochloraz	67747-09-5	4.5E-01	1.2E+00		3.2E-01	1.4E+02	3.6E+02		1.0E+02		1.6E-03	
				6.0E-03	H					Profluralin	26399-36-0					9.4E+01	2.3E+01		1.9E+01		1.2E+00	
				1.5E-02	I					Prometon	1610-18-0					2.3E+02	1.1E+03		1.9E+02		9.2E-02	
				4.0E-03	I					Prometryn	7287-19-6					6.3E+01	1.7E+02		4.5E+01		6.9E-02	
				1.3E-02	I					Propachlor	1918-16-7					2.0E+02	3.1E+03		1.9E+02		1.2E-01	
				5.0E-03	I					Propanil	709-98-8					7.8E+01	3.1E+02		6.3E+01		3.5E-02	
				2.0E-02	I					Propargite	2312-35-8					3.1E+02	1.9E+02		1.2E+02		8.8E+00	
				2.0E-03	I					Propargyl Alcohol	107-19-7					3.1E+01	7.8E+03		3.1E+01		6.4E-03	
				2.0E-02	I					Propazine	139-40-2					3.1E+02	1.7E+03		2.6E+02		2.3E-01	
				2.0E-02	I					Propham	122-42-9					3.1E+02	2.0E+03		2.7E+02		1.7E-01	
				1.3E-02	I					Propiconazole	60207-90-1					2.0E+02	7.5E+02		1.6E+02		5.3E-01	
						8.0E-03	I	V		Propionaldehyde	123-38-6							1.7E+01	1.7E+01		3.4E-03	
				1.0E-01	X	1.0E+00	X	V		Propyl benzene	103-65-1					1.6E+03	1.3E+03	2.1E+03	5.3E+02		9.9E-01	
						3.0E+00	C			Propylene	115-07-1											
				2.0E+01	P					Propylene Glycol	57-55-6					3.1E+05	2.1E+08		3.1E+05		6.3E+01	
						2.7E-04	A	V		Propylene Glycol Dinitrate	6423-43-4							5.7E-01	5.7E-01		1.8E-04	
				7.0E-01	H					Propylene Glycol Monoethyl Ether	1569-02-4					1.1E+04	2.2E+06		1.1E+04		2.2E+00	
				7.0E-01	H	2.0E+00	I			Propylene Glycol Monomethyl Ether	107-98-2					1.1E+04	4.3E+06		1.1E+04		2.2E+00	
2.4E-01	I	3.7E-06	I			3.0E-02	I	V		Propylene Oxide	75-56-9	2.8E-01	4.0E+01	1.3E+00	2.3E-01			6.3E+01	6.3E+01		4.8E-05	
				2.5E-01	I					Pursuit	81335-77-5					3.9E+03			3.9E+03		3.4E+00	
				2.5E-02	I					Pydrin	51630-58-1					3.9E+02			3.9E+02		2.5E+02	
				1.0E-03	I			V		Pyridine	110-86-1					1.6E+01	9.9E+02		1.5E+01		5.3E-03	
				5.0E-04	I					Quinalphos	13593-03-8					7.8E+00	7.3E+00		3.8E+00		3.2E-02	
3.0E+00	I									Quinoline	91-22-5	2.2E-02	2.5E-01		2.1E-02						6.8E-05	
						3.0E-02	A			Refractory Ceramic Fibers	NA											
				3.0E-02	I					Resmethrin	10453-86-8					4.7E+02	5.4E+01		4.8E+01		3.0E+01	
				5.0E-02	H					Ronnel	299-84-3					7.8E+02	4.8E+02		3.0E+02		2.7E+00	
				4.0E-03	I					Rotenone	83-79-4					6.3E+01	1.8E+02		4.7E+01		2.4E+01	
2.2E-01	C	6.3E-05	C						M	Safrole	94-59-7	9.8E-02	1.7E-01		6.2E-02						3.8E-05	
				2.5E-02	I					Savey	78587-05-0					3.9E+02	1.0E+02		8.1E+01		3.6E-01	
				5.0E-03	I					Selenious Acid	7783-00-8					7.8E+01	1.2E+04		7.8E+01			
				5.0E-03	I	2.0E-02	C			Selenium	7782-49-2					7.8E+01	1.2E+04		7.8E+01	5.0E+01	4.0E-01	2.6E-01
				5.0E-03	C	2.0E-02	C			Selenium Sulfide	7446-34-6					7.8E+01	1.2E+04		7.8E-01			
				9.0E-02	I					Sethoxydim	74051-80-2					1.4E+03	1.7E+03		7.8E+02		6.9E+00	
						3.0E-03	C			Silica (crystalline, respirable)	7631-86-9											

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Toxicity and Chemical-specific Information										Contaminant		Carcinogenic Target Risk (TR) = 1E-06				Noncancer Hazard Index (HI) = 1					Protection of	
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD_o (mg/kg-day)	key	RfC_i (mg/m^3)	key	volatile	muta-gen	Analyte	CAS No.	Ingestion SL TR=1.0E-6 (ug/L)	Dermal SL TR=1.0E-6 (ug/L)	Inhalation SL TR=1.0E-6 (ug/L)	Carcinogenic SL TR=1.0E-6 (ug/L)	Ingestion SL HQ=1 (ug/L)	Dermal SL HQ=1 (ug/L)	Inhalation SL HQ=1 (ug/L)	Noncarcinogenic SL HI=1 (ug/L)	MCL (ug/L)	Risk-based SSL (mg/kg)	MCL-based SSL (mg/kg)
				5.0E-03	I					Silver	7440-22-4					7.8E+01	7.9E+02		7.1E+01		6.0E-01	
1.2E-01	H			5.0E-03	I					Simazine	122-34-9	5.6E-01	7.9E+00		5.2E-01	7.8E+01	1.1E+03		7.3E+01	4.0E+00	2.6E-04	2.0E-03
				1.3E-02	I					Sodium Acifluorfen	62476-59-9					2.0E+02	1.5E+05		2.0E+02		1.6E+00	
				4.0E-03	I					Sodium Azide	26628-72-8					6.3E+01	9.5E+03		6.2E+01			
2.7E-01	H			3.0E-02	I					Sodium Diethyldithiocarbamate	148-18-5	2.5E-01			2.5E-01	4.7E+02			4.7E+02			
				5.0E-02	A	1.3E-02	C			Sodium Fluoride	7681-49-4					7.8E+02	1.2E+05		7.8E+02			
				2.0E-05	I					Sodium Fluoroacetate	62-74-8					3.1E-01			3.1E-01		6.3E-05	
				1.0E-03	H					Sodium Metavanadate	13718-26-8					1.6E+01	2.4E+03		1.6E+01			
2.4E-02	H			3.0E-02	I					Stirofos (Tetrachlorovinphos)	961-11-5	2.8E+00	1.6E+01		2.4E+00	4.7E+02	2.7E+03		4.0E+02		7.0E-03	
				6.0E-01	I					Strontium, Stable	7440-24-6					9.4E+03	1.4E+06		9.3E+03		3.3E+02	
				3.0E-04	I					Strychnine	57-24-9					4.7E+00	2.3E+02		4.6E+00		5.1E-02	
				2.0E-01	I	1.0E+00	I	V		Styrene	100-42-5					3.1E+03	7.1E+03	2.1E+03	1.1E+03	1.0E+02	1.2E+00	1.1E-01
				8.0E-04	P					Sulfonylbis(4-chlorobenzene), 1,1'-	80-07-9					1.3E+01			1.3E+01		7.4E-02	
						1.0E-03	C			Sulfuric Acid	7664-93-9											
				2.5E-02	I					Systhane	88671-89-0					3.9E+02	3.4E+03		3.5E+02		4.3E+00	
				3.0E-02	H					TCMTB	21564-17-0					4.7E+02	1.7E+03		3.7E+02		2.6E+00	
				7.0E-02	I					Tebuthiuron	34014-18-1					1.1E+03	3.3E+04		1.1E+03		3.0E-01	
				2.0E-02	H					Temephos	3383-96-8					3.1E+02			3.1E+02		6.0E+01	
				1.3E-02	I					Terbacil	5902-51-2					2.0E+02	4.9E+03		2.0E+02		5.9E-02	
				2.5E-05	H					Terbufos	13071-79-9					3.9E-01	3.2E-01		1.8E-01		3.9E-04	
				1.0E-03	I					Terbutryn	886-50-0					1.6E+01	2.9E+01		1.0E+01		1.4E-02	
				1.0E-04	I					Tetrabromodiphenyl ether, 2,2',4,4'- (BDE-47)	5436-43-1					1.6E+00			1.6E+00		4.2E-02	
				3.0E-04	I					Tetrachlorobenzene, 1,2,4,5-	95-94-3					4.7E+00	1.7E+00		1.2E+00		5.8E-03	
2.6E-02	I	7.4E-06	I	3.0E-02	I			V		Tetrachloroethane, 1,1,1,2-	630-20-6	2.6E+00	9.3E+00	6.6E-01	5.0E-01	4.7E+02	1.7E+03		3.7E+02		1.9E-04	
2.0E-01	I	5.8E-05	C	2.0E-02	I			V		Tetrachloroethane, 1,1,2,2-	79-34-5	3.4E-01	2.8E+00	8.4E-02	6.6E-02	3.1E+02	2.6E+03		2.8E+02		2.6E-05	
5.4E-01	C	5.9E-06	C	1.0E-02	I	2.7E-01	A	V		Tetrachloroethylene	127-18-4	1.2E-01	2.2E-01	8.2E-01	7.2E-02	1.6E+02	2.7E+02	5.7E+02	8.4E+01	5.0E+00	3.3E-05	2.3E-03
				3.0E-02	J					Tetrachlorophenol, 2,3,4,6-	58-90-2					4.7E+02	2.8E+02		1.7E+02		1.1E+00	
2.0E+01	H									Tetrachlorotoluene, p- alpha, alpha, alpha-	5216-25-1	3.4E-03			3.4E-03						1.1E-05	
				5.0E-04	I					Tetraethyl Dithiopyrophosphate	3689-24-5					7.8E+00	1.7E+01		5.3E+00		3.9E-03	
						8.0E+01	I	V		Tetrafluoroethane, 1,1,1,2-	811-97-2							1.7E+05	1.7E+05		9.3E+01	
				4.0E-03	P					Tetryl (Trinitrophenylmethylnitramine)	479-45-8					6.3E+01			6.3E+01		5.9E-01	
				1.0E-05	X					Thallium (Soluble Salts)	7440-28-0					1.6E-01	2.4E+01		1.6E-01	2.0E+00	1.1E-02	1.4E-01
				1.0E-02	I					Thiobencarb	28249-77-6					1.6E+02	5.5E+02		1.2E+02		4.2E-01	
				7.0E-02	X					Thiodiglycol	111-48-8					1.1E+03	6.8E+05		1.1E+03		2.2E-01	
				3.0E-04	H					Thiofanox	39196-18-4					4.7E+00	3.1E+01		4.1E+00		1.4E-03	
				8.0E-02	I					Thiophanate, Methyl	23564-05-8					1.3E+03	1.5E+05		1.2E+03		1.1E+00	
				5.0E-03	I					Thiram	137-26-8					7.8E+01	2.8E+03		7.6E+01		1.1E-01	
				6.0E-01	H					Tin	7440-31-5					9.4E+03	1.4E+06		9.3E+03		2.3E+03	
						1.0E-04	A			Titanium Tetrachloride	7550-45-0											
				8.0E-02	I	5.0E+00	I	V		Toluene	108-88-3					1.3E+03	3.7E+03	1.0E+04	8.6E+02	1.0E+03	5.9E-01	6.9E-01
1.8E-01	X			1.0E-04	X					*Toluene-2,5-diamine*	95-70-5	3.7E-01			3.7E-01	1.6E+00			1.6E+00		1.2E-04	
1.9E-01	H									Toluidine, p-	106-49-0	3.5E-01	9.1E+00		3.4E-01						1.4E-04	
1.1E+00	I	3.2E-04	I							Toxaphene	8001-35-2	6.1E-02	1.7E-02		1.3E-02					3.0E+00	2.1E-03	4.6E-01
				7.5E-03	I					Tralomethrin	66841-25-6					1.2E+02			1.2E+02		4.5E+01	
				3.0E-04	A					Tri-n-butyltin	688-73-3					4.7E+00			4.7E+00		1.0E-01	
				1.3E-02	I					Triallate	2303-17-5					2.0E+02	1.5E+02		8.7E+01		1.9E-01	
				1.0E-02	I					Triasulfuron	82097-50-5					1.6E+02			1.6E+02		1.6E-01	
				5.0E-03	I					*Tribromobenzene, 1,2,4-*	615-54-3					7.8E+01			7.8E+01		1.1E-01	
9.0E-03	P			1.0E-02	P					Tributyl Phosphate	126-73-8	7.5E+00	1.1E+01		4.5E+00	1.6E+02	2.3E+02		9.3E+01		2.2E-02	
				3.0E-04	P					Tributyltin Compounds	NA					4.7E+00			4.7E+00			
				3.0E-04	I					Tributyltin Oxide	56-35-9					4.7E+00	6.7E+01		4.4E+00		2.3E+02	
				3.0E+01	I	3.0E+01	H	V		Trichloro-1,2,2-trifluoroethane, 1,1,2-	76-13-1					4.7E+05	1.4E+06	6.3E+04	5.3E+04		1.3E+02	
7.0E-02	I			2.0E-02	I					Trichloroacetic Acid	76-03-9	9.6E-01	3.9E+01		9.4E-01	3.1E+02	1.3E+04		3.1E+02	6.0E+01	1.9E-04	1.2E-02
2.9E-02	H									Trichloroaniline HCl, 2,4,6-	33663-50-2	2.3E+00	3.2E+03		2.3E+00						6.4E-03	
7.0E-03	X			3.0E-05	X					*Trichloroaniline, 2,4,6-*	634-93-5	9.6E+00	1.7E+01		6.1E+00	4.7E-01	8.3E-01		3.0E-01		2.7E-03	
				8.0E-04	X			V		Trichlorobenzene, 1,2,3-	87-61-6					1.3E+01	8.9E+00		5.2E+00		1.5E-02	
2.9E-02	P			1.0E-02	I	2.0E-03	P	V		Trichlorobenzene, 1,2,4-	120-82-1	2.3E+00	1.7E+00		9.9E-01	1.6E+02	1.2E+02	4.2E+00	3.9E+00	7.0E+01	2.9E-03	2.0E-01
				2.0E+00	I	5.0E+00	I	V		Trichloroethane, 1,1,1-	71-55-6					3.1E+04	1.8E+05	1.0E+04	7.5E+03	2.0E+02	2.6E+00	7.0E-02
5.7E-02	I	1.6E-05	I	4.0E-03	I	2.0E-04	X	V		Trichloroethane, 1,1,2-	79-00-5	1.2E+00	1.7E+01	3.0E-01	2.4E-01	6.3E+01	8.9E+02	4.2E-01	4.1E-01	5.0E+00	7.7E-05	1.6E-03
See FAQ	I	See FAQ	I	5.0E-04	I	2.0E-03	I	V	M	Trichloroethylene	79-01-6	1.0E+00	6.6E+00	8.6E-01	4.4E-01	7.8E+00	4.9E+01	4.2E+00	2.6E+00	5.0E+00	1.6E-04	1.8E-03
				3.0E-01	I	7.0E-01	H	V		Trichlorofluoromethane	75-69-4					4.7E+03	2.6E+04	1.5E+03	1.1E+03		6.9E-01	
				1.0E-01	I					*Trichlorophenol, 2,4,5-*	95-95-4					1.6E+03	2.0E+03		8.9E+02		3.3E+00	
1.1E-02	I	3.1E-06	I	1.0E-03	P					Trichlorophenol, 2,4,6-	88-06-2	6.1E+00	8.3E+00		3.5E+00	1.6E+01	2.1E+01		9.0E+00		1.3E-02	
				1.0E-02	I					Trichlorophenoxyacetic Acid, 2,4,5-	93-76-5					1.6E+02	6.2E+02		1.2E+02		5.2E-02	
				8.0E-03	I					Trichlorophenoxypropionic acid, -2,4,5	93-72-1					1.3E+02	2.6E+02		8.4E+01	5.0E+01	4.6E-02	2.8E-02

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Toxicity and Chemical-specific Information										Contaminant		Carcinogenic Target Risk (TR) = 1E-06				Noncancer Hazard Index (HI) = 1					Protection of	
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD$_o$ (mg/kg-day)	key	RfC$_i$ (mg/m^3)	key	vol	muta-gen	Analyte	CAS No.	Ingestion SL TR=1.0E-6 (ug/L)	Dermal SL TR=1.0E-6 (ug/L)	Inhalation SL TR=1.0E-6 (ug/L)	Carcinogenic SL TR=1.0E-6 (ug/L)	Ingestion SL HQ=1 (ug/L)	Dermal SL HQ=1 (ug/L)	Inhalation SL HQ=1 (ug/L)	Noncarcinogenic SL HI=1 (ug/L)	MCL (ug/L)	Risk-based SSL (mg/kg)	MCL-based SSL (mg/kg)
				5.0E-03	I			V		Trichloropropane, 1,1,2-	598-77-6					7.8E+01			7.8E+01		3.1E-02	
3.0E+01	I			4.0E-03	I	3.0E-04	I	V	M	Trichloropropane, 1,2,3-	96-18-4	7.2E-04	6.7E-03		6.5E-04	6.3E+01	5.4E+02	6.3E-01	6.2E-01		2.8E-07	
				3.0E-03	X	3.0E-04	P	V		Trichloropropene, 1,2,3-	96-19-5					4.7E+01		6.3E-01	6.2E-01		3.1E-04	
				3.0E-03	I					Tridiphane	58138-08-2					4.7E+01			4.7E+01		3.3E-01	
						7.0E-03	I	V		Triethylamine	121-44-8							1.5E+01	1.5E+01		4.4E-03	
7.7E-03	I			7.5E-03	I					Trifluralin	1582-09-8	8.7E+00	2.9E+00		2.2E+00	1.2E+02	3.9E+01		2.9E+01		7.2E-02	
2.0E-02	P			1.0E-02	P					Trimethyl Phosphate	512-56-1	3.4E+00	2.4E+03		3.4E+00	1.6E+02	1.1E+05		1.6E+02		7.4E-04	
						5.0E-03	P	V		Trimethylbenzene, 1,2,3-	526-73-8							1.0E+01	1.0E+01		1.5E-02	
						7.0E-03	P	V		Trimethylbenzene, 1,2,4-	95-63-6							1.5E+01	1.5E+01		2.1E-02	
				1.0E-02	X			V		Trimethylbenzene, 1,3,5-	108-67-8					1.6E+02	2.0E+02		8.7E+01		1.2E-01	
				3.0E-02	I					Trinitrobenzene, 1,3,5-	99-35-4					4.7E+02	3.3E+04		4.6E+02		1.7E+00	
3.0E-02	I			5.0E-04	I					Trinitrotoluene, 2,4,6-	118-96-7	2.2E+00	9.1E+01		2.2E+00	7.8E+00	3.2E+02		7.6E+00		1.3E-02	
				2.0E-02	P					Triphenylphosphine Oxide	791-28-6					3.1E+02	2.7E+03		2.8E+02		1.2E+00	
2.0E-02	P			7.0E-03	P					Tris(2-chloroethyl)phosphate	115-96-8	3.4E+00	2.5E+02		3.3E+00	1.1E+02	8.3E+03		1.1E+02		3.2E-03	
3.2E-03	P			1.0E-01	P					Tris(2-ethylhexyl)phosphate	78-42-2	2.1E+01			2.1E+01	1.6E+03			1.6E+03		1.0E+02	
				3.0E-03	I	3.0E-04	A			Uranium (Soluble Salts)	NA					4.7E+01	7.1E+03		4.7E+01	3.0E+01	2.1E+01	1.4E+01
1.0E+00	C	2.9E-04	C						M	Urethane	51-79-6	2.2E-02	5.6E+00		2.1E-02						4.8E-06	
		8.3E-03	P	9.0E-03	I	7.0E-06	P			Vanadium Pentoxide	1314-62-1					1.4E+02	5.5E+02		1.1E+02			
				5.0E-03	S					Vanadium and Compounds	NA					7.9E+01	1.2E+04		7.8E+01		7.8E+01	
				1.0E-03	I					Vernolate	1929-77-7					1.6E+01	1.8E+01		8.3E+00		6.6E-03	
				2.5E-02	I					Vinclozolin	50471-44-8					3.9E+02	2.6E+03		3.4E+02		2.6E-01	
				1.0E+00	H	2.0E-01	I	V		Vinyl Acetate	108-05-4					1.6E+04	9.2E+05	4.2E+02	4.1E+02		8.7E-02	
		3.2E-05	H			3.0E-03	I	V		Vinyl Bromide	593-60-2			1.5E-01	1.5E-01			6.3E+00	6.3E+00		4.4E-05	
7.2E-01	I	4.4E-06	I	3.0E-03	I	1.0E-01	I	V	M	Vinyl Chloride	75-01-4	1.7E-02	2.6E-01	3.2E-01	1.5E-02	4.7E+01	5.8E+02	2.1E+02	3.6E+01	2.0E+00	5.3E-06	6.9E-04
				3.0E-04	I					Warfarin	81-81-2					4.7E+00	6.0E+01		4.4E+00		4.6E-03	
				2.0E-01	S	1.0E-01	S	V		Xylene, P-	106-42-3					3.1E+03	5.3E+03	2.1E+02	1.9E+02		1.8E-01	
				2.0E-01	S	1.0E-01	S	V		Xylene, m-	108-38-3					3.1E+03	4.9E+03	2.1E+02	1.9E+02		1.8E-01	
				2.0E-01	S	1.0E-01	S	V		Xylene, o-	95-47-6					3.1E+03	5.5E+03	2.1E+02	1.9E+02		1.9E-01	
				2.0E-01	I	1.0E-01	I	V		Xylenes	1330-20-7					3.1E+03	5.5E+03	2.1E+02	1.9E+02	1.0E+04	1.9E-01	9.8E+00
				3.0E-04	I					Zinc Phosphide	1314-84-7					4.7E+00	1.2E+03		4.7E+00			
				3.0E-01	I					Zinc and Compounds	7440-66-6					4.7E+03	1.2E+06		4.7E+03		2.9E+02	
				5.0E-02	I					Zineb	12122-67-7					7.8E+02			7.8E+02		2.3E+00	

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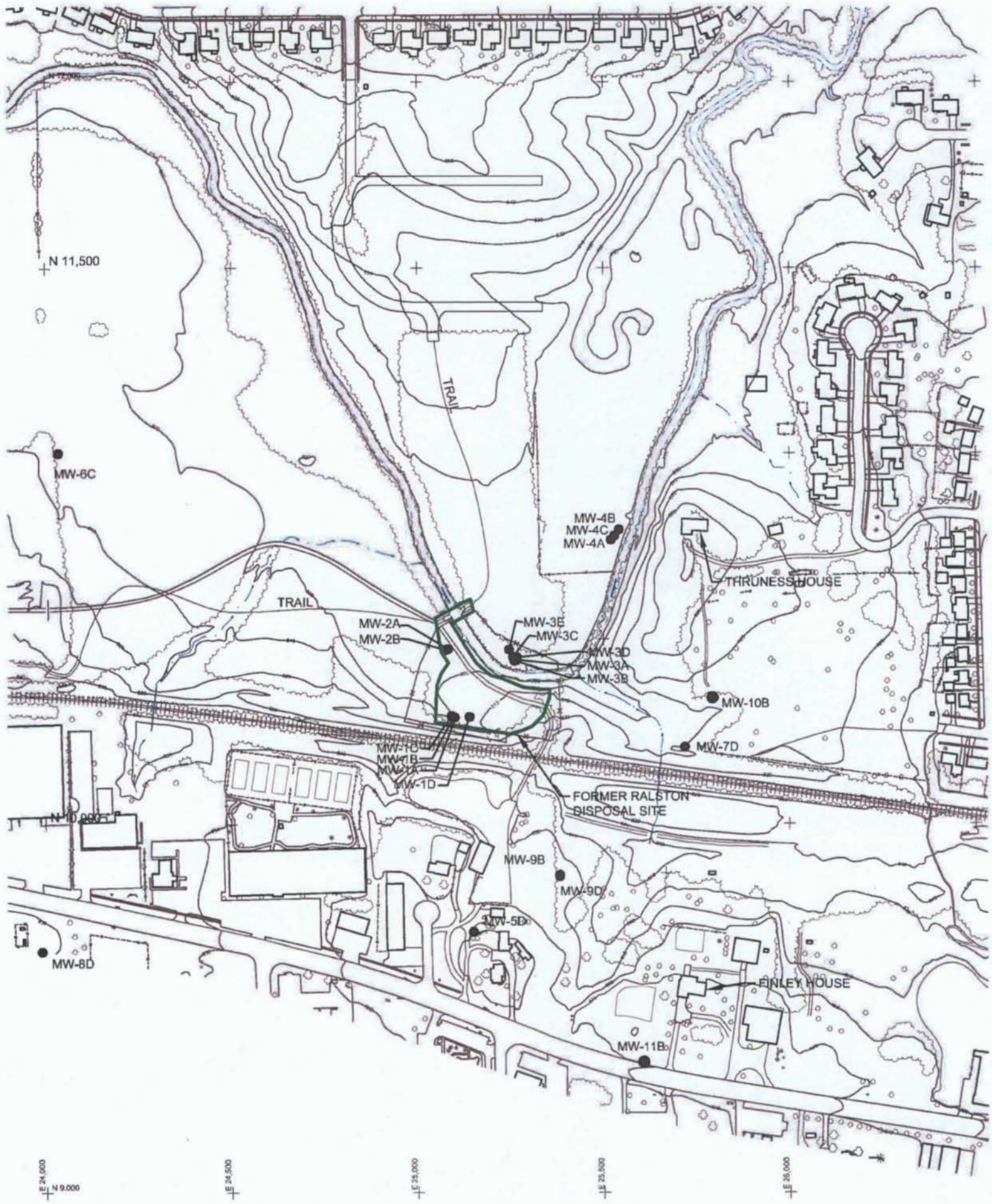


LEGEND:

- MONITORING WELL
- EXTENT OF DISPOSAL CAP
- —x———x— FENCE

ASSIGNED BY	-	
DRAWN BY	NORA DAY	
CHECKED BY	ROB MALCOMSON	
APPROVED BY		
PROJECT MANAGER	STEVE VARSA	
CLIENT APPROVAL	-	
CLIENT REFERENCE NO.	-	

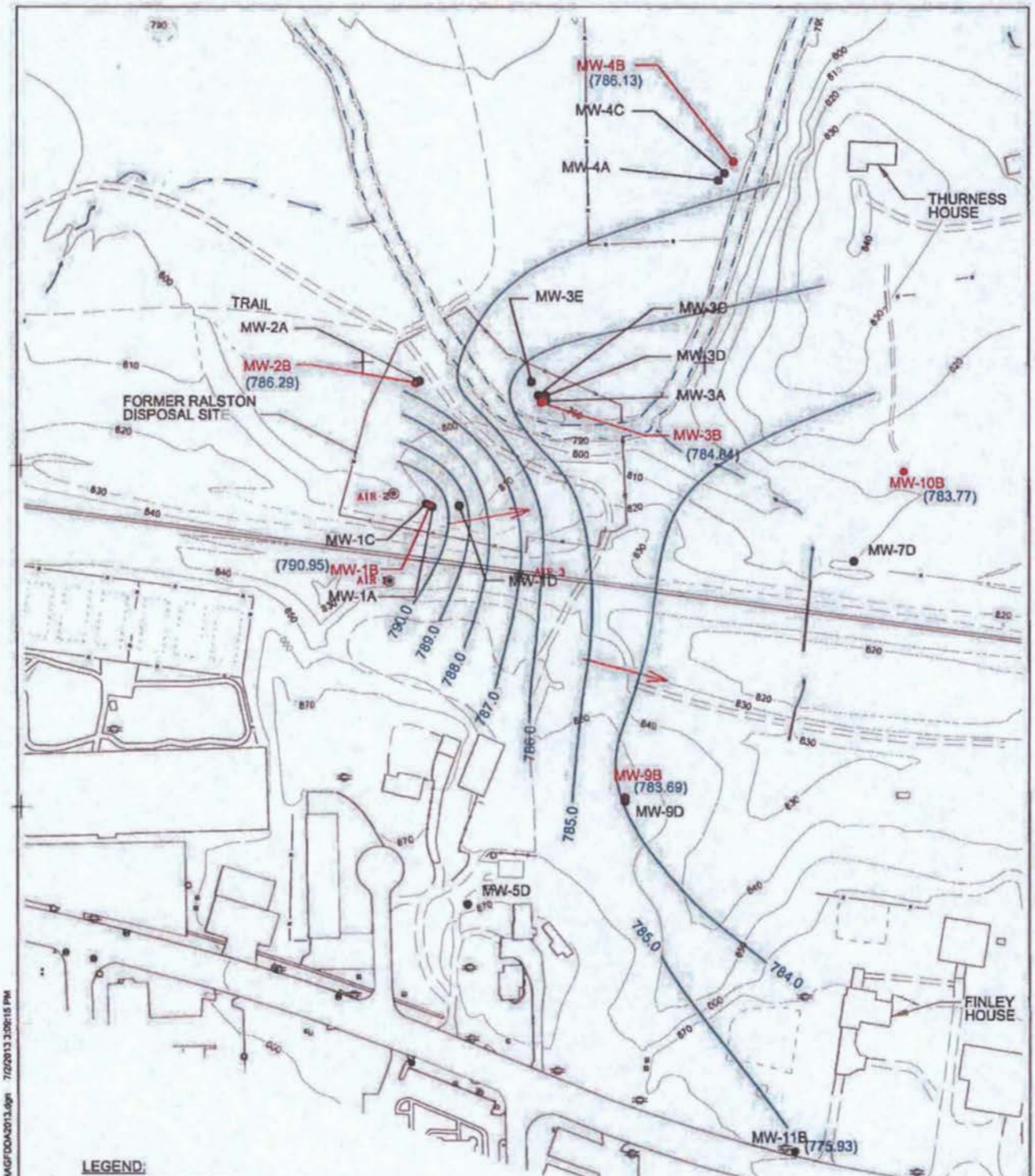
0 150 300
SCALE IN FEET

PROJECT LOCATION: DES MOINES, IOWA
PROJECT: ROCKWELL COLLINS, INC
CEDAR RAPIDS, IOWA

TITLE: SITE MAP

MWH

FIGURE: 1
REVISION:
FILE NAME:



DESIGNED BY	-
DRAWN BY	NORA DAY
CHECKED BY	MIKE ALOWITZ
APPROVED BY	-
PROJECT MANAGER	STEVE VARSA
CLIENT APPROVAL	-
CLIENT REFERENCE NO.	

PROJECT LOCATION: DES MOINES, IOWA

PROJECT: ROCKWELL COLLINS, INC
CEDAR RAPIDS, IOWA

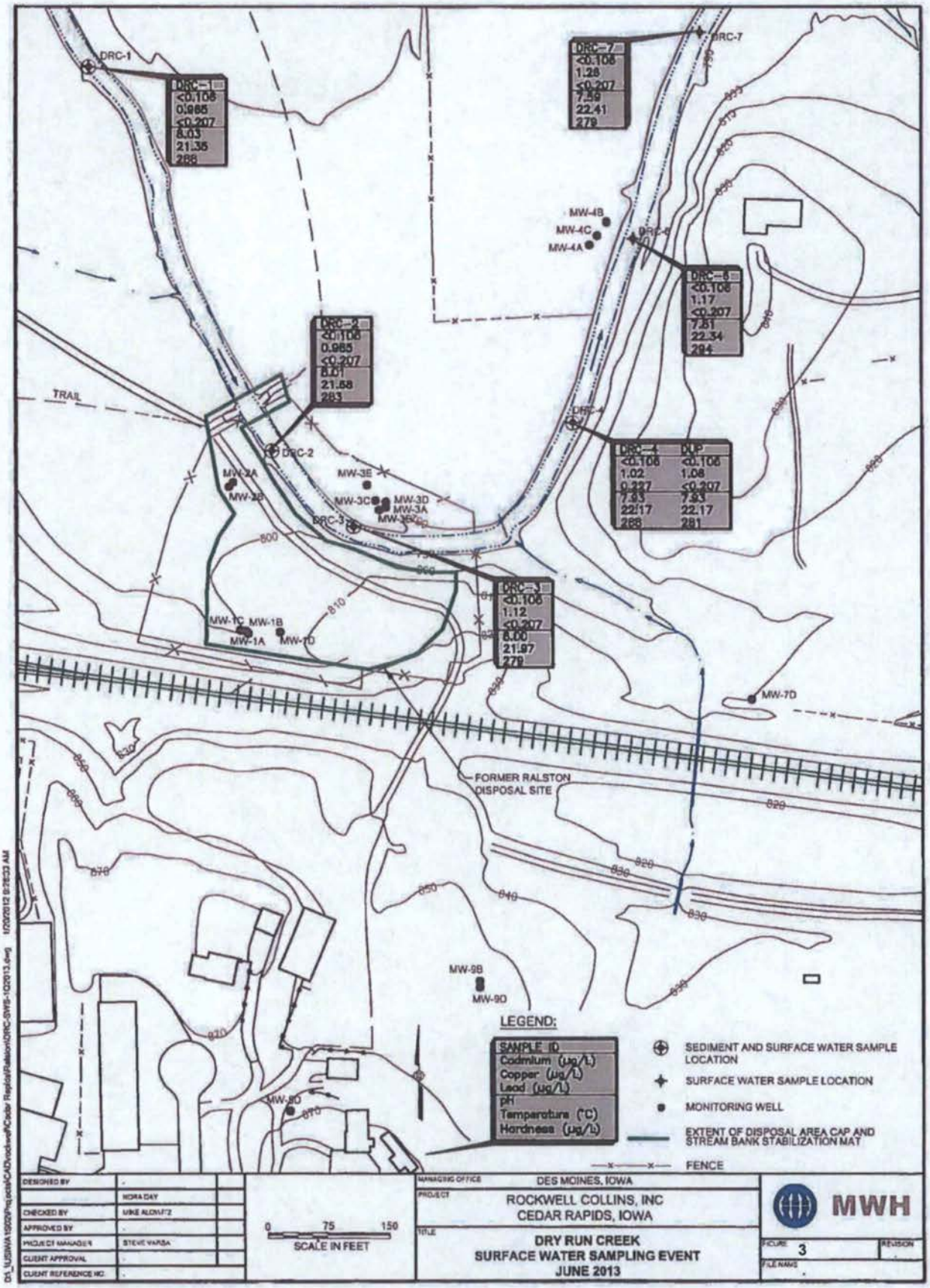
TITLE: APPROXIMATE GROUNDWATER FLOW DIRECTION
DEVONIAN AQUIFER (B WELLS)
JUNE 11, 2013

MWH

FIGURE 2

REVISION -

FILE NAME -


DRC-1
DRC-1
<0.106
0.985
<0.207
8.03
21.35
288
DRC-7
DRC-7
<0.106
1.28
<0.207
7.59
22.41
279
MW-4B
MW-4C
MW-4A
DRC-4
DRC-6
<0.106
1.17
<0.207
7.51
22.34
294
DRC-2
<0.106
0.985
<0.207
8.01
21.58
283
TRAIL
DRC-2
MW-2A
MW-2B
MW-3E
MW-3C
MW-3D
MW-3A
MW-3B
DRC-3
DRC-4
DRC-4
DUP
<0.106
1.02
0.227
7.83
22.17
268
<0.106
1.08
<0.207
7.83
22.17
281
DRC-3
<0.106
1.12
<0.207
8.00
21.97
279
MW-1C
MW-1B
MW-1A
MW-1D
MW-7D
FORMER RALSTON
DISPOSAL SITE
MW-9B
MW-9D
MW-8D
LEGEND:
SAMPLE ID
Cadmium (µg/L)
Copper (µg/L)
Lead (µg/L)
pH
Temperature (°C)
Hardness (µg/L)
SEDIMENT AND SURFACE WATER SAMPLE LOCATION
SURFACE WATER SAMPLE LOCATION
MONITORING WELL
EXTENT OF DISPOSAL AREA CAP AND STREAM BANK STABILIZATION MAT
FENCE
DESIGNED BY
NORA DAY
CHECKED BY
MIKE ALOVITZ
APPROVED BY
PROJECT MANAGER
STEVE VARGA
CLIENT APPROVAL
CLIENT REFERENCE NO.
0
75
150
SCALE IN FEET
MANAGING OFFICE
DES MOINES, IOWA
PROJECT
ROCKWELL COLLINS, INC
CEDAR RAPIDS, IOWA
TITLE
DRY RUN CREEK
SURFACE WATER SAMPLING EVENT
JUNE 2013
MWH
FIGURE
3
REVISION
FILE NAME

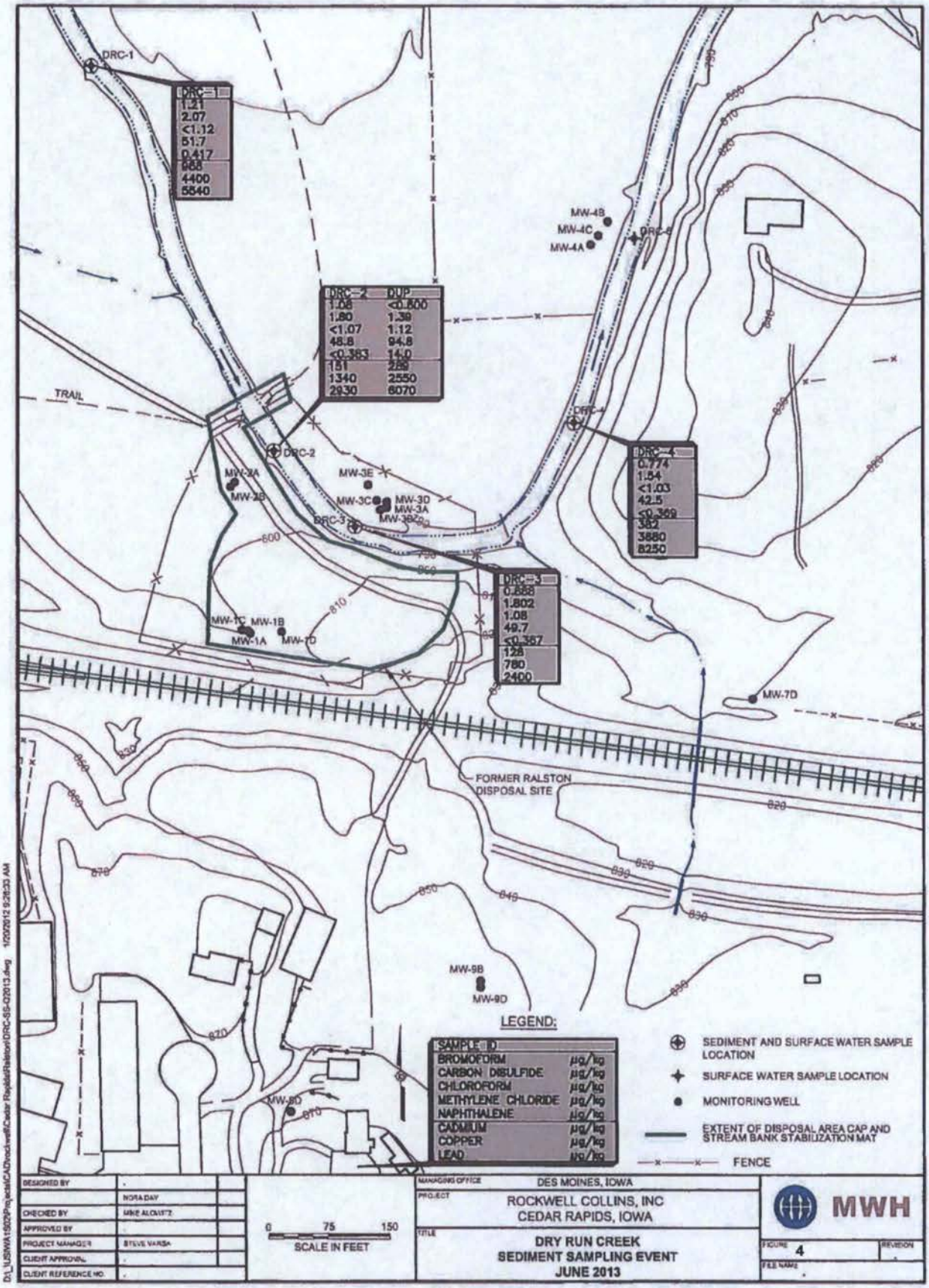

DRC-1
DRC-2
DRC-3
DRC-4
DRC-5
DUP
TRAIL
MW-1A
MW-1B
MW-1C
MW-1D
MW-2A
MW-2B
MW-3A
MW-3B
MW-3C
MW-3D
MW-3E
MW-4A
MW-4B
MW-4C
MW-7D
MW-8D
MW-9B
MW-9D
FORMER RALSTON DISPOSAL SITE
LEGEND:
SAMPLE ID
BROMOFORM µg/kg
CARBON DISULFIDE µg/kg
CHLOROFORM µg/kg
METHYLENE CHLORIDE µg/kg
NAPHTHALENE µg/kg
CADMIUM µg/kg
COPPER µg/kg
LEAD µg/kg
SEDIMENT AND SURFACE WATER SAMPLE LOCATION
SURFACE WATER SAMPLE LOCATION
MONITORING WELL
EXTENT OF DISPOSAL AREA CAP AND STREAM BANK STABILIZATION MAT
FENCE
0 75 150
SCALE IN FEET
DES MOINES, IOWA
ROCKWELL COLLINS, INC
CEDAR RAPIDS, IOWA
DRY RUN CREEK
SEDIMENT SAMPLING EVENT
JUNE 2013
MWH
FIGURE 4

TABLE 1

JUNE 2013 GROUNDWATER ANALYTICAL RESULTS – VOLATILE ORGANIC COMPOUNDS
FORMER RALSTON DISPOSAL SITE – CEDAR RAPIDS, IOWA

Well ID: / Sample Date: / Compound	MW-1A 06/12/13	MW-1B 06/12/13	MW-1C 06/12/13	MW-1D 06/12/13	MW-2A[a] 06/13/13	MW-2B 06/13/13	MW-3A 06/13/13	MW-3B 06/13/13	MW-3C 06/13/13	MW-3D[b] 06/13/13
Acetone	<10.0	<10.0	<10.0	<10.0	<10.0 / <10.0	<10.0	<10.0	<10.0	<10.0	<10.0 / <10.0
Benzene	<0.500	<0.500	<0.500	<0.500	<0.500 / <0.500	<1.0	**2.04**	**17.1**	**55.4**	<0.500 / <0.500
Bromodichloromethane	<1.0	<1.0	<1.0	<1.0	<1.0 / <1.0	<5.0	<5.0	<5.0	<5.0	<1.0 / <1.0
Bromoform	<5.0	<5.0	<5.0	<5.0	<5.0 / <5.0	<4.0	<4.0	<4.0	<4.0	<5.0 / <5.0
Bromomethane	<4.0	<4.0	<4.0	<4.0	<4.0 / <4.0	<10.0	<10.0	<10.0	<10.0	<4.0 / <4.0
2-Butanone (MEK)	<10.0	<10.0	<10.0	<10.0	<10.0 / <10.0	<1.0	<1.0	<1.0	<1.0	<10.0 / <10.0
Carbon Disulfide	<1.0	<1.0	<1.0	<1.0	<1.0 / <1.0	<2.0	<2.0	<2.0	<2.0	<1.0 / <1.0
Carbon Tetrachloride	<2.0	<2.0	<2.0	<2.0	<2.0 / <2.0	<1.0	<1.0	<1.0	<1.0	<2.0 / <2.0
Chlorobenzene	<1.0	<1.0	<1.0	<1.0	<1.0 / <1.0	<5.0	<5.0	<5.0	<5.0	<1.0 / <1.0
Chlorodibromomethane	<5.0	<5.0	<5.0	<5.0	<5.0 / <5.0	<4.0	<4.0	<4.0	<4.0	<5.0 / <5.0
Chloroethane	<4.0	<4.0	<4.0	<4.0	<4.0 / <4.0	<1.0	<1.0	<1.0	<1.0	<4.0 / <4.0
Chloroform	<1.0	<1.0	<1.0	<1.0	<1.0 / <1.0	<3.0	<3.0	<3.0	<3.0	<1.0 / <1.0
Chloromethane	<3.0	<3.0	<3.0	<3.0	<3.0 / <3.0	<1.0	<1.0	<1.0	<1.0	<3.0 / <3.0
1,2-Dichlorobenzene	<1.0	<1.0	<1.0	<1.0	<1.0 / <1.0	<1.0	**2.44**	<1.0	<1.0	<1.0 / <1.0
1,3-Dichlorobenzene	<1.0	<1.0	<1.0	<1.0	<1.0 / <1.0	<1.0	<1.0	<1.0	<1.0	<1.0 / <1.0
1,4-Dichlorobenzene	<1.0	<1.0	<1.0	<1.0	<1.0 / <1.0	<1.0	<1.0	<1.0	<1.0	<1.0 / <1.0
1,1-Dichloroethane	<1.0	<1.0	<1.0	<1.0	<1.0 / <1.0	<1.0	**2.71**	<1.0	**1.45**	<1.0 / <1.0
1,2-Dichloroethane	<1.0	<1.0	<1.0	<1.0	<1.0 / <1.0	<2.0	<2.0	<2.0	<2.0	<1.0 / <1.0
1,1-Dichloroethene	<2.0	<2.0	**3.22**	<2.0	<2.0 / <2.0	<2.0	**164**	**159**	**194**	<2.0 / <2.0
cis-1,2-Dichloroethene	<1.0	**3.68**	**250**	**19.7**	<1.0 / <1.0	<1.0	**12,600**	**6,330**	**16100**	<1.0 / <1.0
trans-1,2-Dichlorothene	<1.0	<1.0	**1.77**	<1.0	<1.0 / <1.0	<1.0	**110**	**46.3**	**219**	<1.0 / <1.0
1,2-Dichloropropane	<1.0	<1.0	<1.0	<1.0	<1.0 / <1.0	<1.0	<1.0	<1.0	<1.0	<1.0 / <1.0
cis-1,3-Dichloropropene	<5.0	<5.0	<5.0	<5.0	<5.0 / <5.0	<5.0	<5.0	<5.0	<5.0	<5.0 / <5.0
trans-1,3-Dichloropropene	<5.0	<5.0	<5.0	<5.0	<5.0 / <5.0	<5.0	<5.0	<5.0	<5.0	<5.0 / <5.0
Ethylbenzene	<1.0	<1.0	<1.0	<1.0	<1.0 / <1.0	<1.0	<1.0	<1.0	<1.0	<1.0 / <1.0
2-Hexanone	<10.0	<10.0	<10.0	<10.0	<10.0 / <10.0	<10.0	<10.0	<10.0	<10.0	<10.0 / <10.0
4-Methyl-2-pentanone (MIBK)	<10.0	<10 0	<10.0	<10.0	<10.0 / <10.0	<10.0	<10.0	<10.0	<10.0	<10.0 / <10.0
Methylene Chloride	<5.0	<5.0	<5 0	<5.0	<5.0 / <5.0	<5.0	<5.0	<5.0	<5.0	<5.0 / <5.0

TABLE 1 (CONTINUED)

JUNE 2013 GROUNDWATER ANALYTICAL RESULTS – VOLATILE ORGANIC COMPOUNDS
FORMER RALSTON DISPOSAL SITE – CEDAR RAPIDS, IOWA

Compound / Well ID: / Sample Date:	MW-1A 06/12/13	MW-1B 06/12/13	MW-1C 06/12/13	MW-1D 06/12/13	MW-2A[a] 06/13/13	MW-2B 06/13/13	MW-3A 06/13/13	MW-3B 06/13/13	MW-3C 06/13/13	MW-3D[b] 06/13/13
Methyl tert-Butyl Ether (MTBE)	<1.0	<1.0	<1.0	<1.0	<1.0 / <1.0	<1.0	<1.0	<1.0	<1.0	<1.0 / <1.0
Naphthalene	<5.0	<5.0	<5.0	<5.0	<5.0 / <5.0	<5.0	<5.0	<5.0	<5.0	<5.0 / <5.0
1,1,2,2-Tetrachloroethane	<1.0	<1.0	<1.0	<1.0	<1.0 / <1.0	<1.0	<1.0	<1.0	<1.0	<1.0 / <1.0
Tetrachloroethene	<1.0	**2.84**	<1.0	<1.0	<1.0 / <1.0	<1.0	<1.0	<1.0	<1.0	<1.0 / <1.0
Toluene	<1.0	<1.0	<1.0	<1.0	<1.0 / <1.0	<1.0	<1.0	<1.0	**3.17**	<1.0 / <1.0
1,1,1-Trichloroethane	<1.0	<1.0	<1.0	<1.0	<1.0 / <1.0	<1.0	<1.0	<1.0	<1.0	<1.0 / <1.0
1,1,2-Trichloroethane	<1.0	<1.0	<1.0	<1.0	<1.0 / <1.0	<1.0	<1.0	<1.0	<1.0	<1.0 / <1.0
Trichloroethene	<1.0	**17.8**	**41.4**	**3.26**	<1.0 / <1.0	<1.0	**2,140**	**315**	<1.0	<1.0 / <1.0
Vinyl Chloride	<1.0	<1.0	<1.0	<1.0	<1.0 / <1.0	**797**	**555**	**2100**	**4,700**	<1.0 / <1.0
Xylenes, Total	<3.0	<3.0	<3.0	<3.0	<3.0 / <3.0	<3.0	<3.0	<3.0	<3.0	<3.0 / <3.0

TABLE 1 (CONTINUED)

JUNE 2013 GROUNDWATER ANALYTICAL RESULTS – VOLATILE ORGANIC COMPOUNDS
FORMER RALSTON DISPOSAL SITE – CEDAR RAPIDS, IOWA

Well ID: / Sample Date: / Compound	MW-3E 06/13/13	MW-4A 06/11/13	MW-4B 06/11/13	MW-4C 06/11/13	MW-5D 06/12/12	MW-7D 06/12/12	MW-8D 06/11/13	MW-9B 06/12/13	MW-9D 06/12/13	MW-10B 06/12/13	MW-11B 06/12/13
Acetone	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
Benzene	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
Bromodichloromethane	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromoform	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Bromomethane	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
2-Butanone (MEK)	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
Carbon Disulfide	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Carbon Tetrachloride	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chlorobenzene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorodibromomethane	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Chloroethane	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
Chloroform	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloromethane	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
1,2-Dichlorobenzene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichlorobenzene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,4-Dichlorobenzene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethane	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethene	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
cis-1,2-Dichloroethene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**91.5 B**	**10.3**	<1.0	<1.0
trans-1,2-Dichlorothene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**2.40**	<1.0	<1.0	<1.0
1,2-Dichloropropane	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
cis-1,3-Dichloropropene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
trans-1,3-Dichloropropene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Ethylbenzene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-Hexanone	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
4-Methyl-2-pentanone (MIBK)	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
Methylene Chloride	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0

TABLE 1 (CONTINUED)

JUNE 2013 GROUNDWATER ANALYTICAL RESULTS – VOLATILE ORGANIC COMPOUNDS
FORMER RALSTON DISPOSAL SITE – CEDAR RAPIDS, IOWA

Well ID: / Sample Date: / Compound	MW-3E 06/13/13	MW-4A 06/11/13	MW-4B 06/11/13	MW-4C 06/11/13	MW-5D 06/12/12	MW-7D 06/12/12	MW-8D 06/11/13	MW-9B 06/12/13	MW-9D 06/12/13	MW-10B 06/12/13	MW-11B 06/12/13
Methyl tert-Butyl Ether (MTBE)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Naphthalene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,1,2,2-Tetrachloroethane	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,1-Trichloroethane	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethylene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**2.26**	**1.77**	<1.0	<1.0
Vinyl Chloride	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**1.99**	<1.0	<1.0	<1.0
Xylenes, Total	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0

Notes:

Concentrations are presented in microgram(s) per liter (µg/L).

[a] Blind duplicate sample collected from MW-2A labeled as MW-2C (duplicate sample indicated second).

[b] Blind duplicate sample collected from MW-3D, labeled as MW-1E (duplicate sample indicated second).

< = Less than.

B = Analyte was detected in the associated method blank.

B1 = Analyte was detected in the associated Method Blank. Analyte concentration in the sample is greater than 10x the concentration found in the method blank.

C9 = Calibration verification recovery was outside the method control limits for this analyte. The LCS (laboratory control standard) for this analyte met CCV (continuing calibration verification) acceptance criteria, and was used to validate the batch.

CIN = The percent (%) relative standard deviation (RSD) for this compound was above 15%. The average % RSD for all compounds in the calibration met the 15% criteria specified in EPA Methods 8260B/8270C.

M1 = The MS (matrix spike) and/or MSD (matrix spike duplicate) was outside control limits.

SECOND FIVE-YEAR REVIEW

RALSTON SITE

CEDAR RAPIDS, IOWA

June 2011

Prepared by:
United States Environmental Protection Agency
Region 7
901 North Fifth Street
Kansas City, Kansas 66101

Approved by:

Cecilia Tapia, Director
Superfund Division

6/30/11
Date

8.0

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List of Abbreviations

ARARs	Applicable or relevant and appropriate requirements
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
Cis-1,2-DCE	Cis-1,2-dichloroethene
CFR	Code of Federal Regulations
DDT	Dichlorodiphenyltrichloroethane
DVE	Dual vapor extraction
EPA	U.S. Environmental Protection Agency
ERA	Ecological Risk Assessment
IDNR	Iowa Department of Natural Resources
MCL	Maximum Contaminant Level
NCP	National Contingency Plan
NPL	National Priorities List
O&M	Operation and maintenance
PCB	Polychlorinated biphenyl
RAO	Remedial action objective
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RSL	Regional Screening Level
TBC	To Be Considered
TCE	Trichloroethene
VOCs	Volatile organic compounds
µg/l	Microgram per liter

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site name *(from WasteLAN)*: Ralston Site		
EPA ID *(from WasteLAN)*: IAD980632491		
Region: 7	**State:** IA	**City/County:** Cedar Rapids/Linn
SITE STATUS		
NPL status: ☐ Final ☐ Deleted X Other (specify) Not on NPL, state deferral		
Remediation status (choose all that apply): ☐ Under Construction X Operating ☐ Complete		
Multiple OUs?* ☐ YES X NO	**Construction completion date:** 9 / 14 / 2000	
Has site been put into reuse? ☐ YES X NO		
REVIEW STATUS		
Lead agency: ☐ EPA X State ☐ Tribe ☐ Other Federal Agency		
Author name: Diana Engeman		
Author title: Remedial Project Manager	**Author affiliation:** U.S. EPA-Region 7	
Review period:** 1 / 5 / 2011 to 6 /30/2011		
Date(s) of site inspection: 4 /14 / 2011		
Type of review: ☐ Post-SARA ☐ Pre-SARA ☐ NPL-Removal only X Non-NPL Remedial Action Site ☐ NPL State/Tribe-lead ☐ Regional Discretion)		
Review number: 1 (first) X 2 (second) ☐ 3 (third) ☐ Other (specify)		
Triggering action: ☐ Actual RA On-site Construction at OU #___ ☐ Actual RA Start at OU# 01 ☐ Construction Completion X Previous Five-Year Review Report ☐Other (specify) Remedial action start		
Triggering action date *(from WasteLAN)*: 5 / 18/ 2006		
Due date *(five years after triggering action date)*: 5 /18 / 2011		

* ["OU" refers to operable unit.]
** [Review period should correspond to the actual start and end dates of the Five-Year Review in WasteLAN.]

Five-Year Review Summary Form, cont'd.

Issues:

It is not clearly demonstrated that the extent of contamination has been defined to the east of MW-3B or MW-9B in the Devonian aquifer.

The vapor intrusion exposure pathway has not been evaluated at the Ralston site.

The sediments and surface water of Dry Run Creek have not been sampled since prior to the ROD.

Listing on the state Registry of Hazardous Waste or Hazardous Substance Disposal Sites is not as enforceable as an environmental covenant.

Recommendations and Follow-up Actions:

Take actions, possibly including installation of monitoring wells to define the extent of groundwater contamination to the east in the Devonian aquifer.

Evaluate the potential for vapor intrusion utilizing multiple lines of evidence.

Sample sediments and surface water of Dry Run Creek and amend O&M Plan to include periodic sampling.

Implement Uniform Environmental Covenant on the site property.

Protectiveness Statement:

A protectiveness determination for the remedy at the Ralston site cannot be made until further information is obtained. Further information will be obtained by conducting a vapor intrusion study and collecting and evaluating sediment and surface water data from Dry Run Creek. It is expected that this evaluation will take approximately two years to complete, at which time a protectiveness determination may be made.

Other Comments:

None

Executive Summary

The Ralston site is located north of 228 Blairs Ferry Road, just south of Dry Run Creek, and about ½ mile east of C Avenue on the north side of Cedar Rapids, Linn County, Iowa (see Figure 1). The site was formerly used for industrial waste disposal. The disposal area occupies 1.5 acres and is enclosed with a fence with a locked gate.

From 1956 to 1958, a waste contractor disposed of industrial wastes on his property. The contractor collected these wastes from Collins Radio Company and other local businesses. Solvents and other debris were burned at the site and small containers of cyanide wastes were encapsulated in concrete and buried. In 1981, Rockwell International (now Rockwell Collins, Inc.), the successor in interest to Collins Radio Company, notified the U.S. Environmental Protection Agency of this disposal site.

In 1985, the EPA launched an investigation of the Ralston site. Rockwell Collins conducted additional investigations in the early 1990s. Soil and groundwater contamination was found at the site. Soil contamination was found primarily in the subsurface and limited to the site. Groundwater containing chlorinated solvents was found within about 300 feet around the site, extending approximately 900 feet to the south-southeast to about Blairs Ferry Road. Two private wells were found to be impacted, with one above drinking water standards. Both residences were connected to a municipal water supply.

In 1989, Rockwell Collins removed and disposed of two containers of concrete-encapsulated cyanide. No other cyanide containers were found. Other cleanup actions were completed in 1997 including: removing contaminants from shallow soils; pumping and treating groundwater; placing a cap composed of clay and soil over the disposal area; and stabilizing the bank of the adjacent Dry Run Creek. A state rule restricting new groundwater wells within a mile of the site was established in 1996.

Rockwell Collins continues to monitor the site under the oversight of the Iowa Department of Natural Resources. Groundwater is sampled annually at 19 monitoring wells and 2 private wells. Two additional private wells are sampled semiannually. The disposal area cap and creek bank stabilization are inspected semiannually and any problems identified are addressed. It is verified annually that the institutional controls remain in place and effective. Due to a change in the direction of groundwater flow in the Devonian aquifer, the extent of contamination to the east of the site is uncertain. In the other zones the extent of groundwater contamination has not expanded. The integrity of the cap and creek bank stabilization remains in good condition.

Four issues that need to be addressed have been identified during this five-year review. They are: (1) the extent of groundwater contamination has not been defined east of MW-3B and MW-9B, (2) the vapor intrusion pathway has not been evaluated, (3) sediment and surface water have not been sampled since the Record of Decision (ROD), and (4) listing on the state Registry of Hazardous Waste or Hazardous Substance Disposal Sites is not as enforceable as an environmental covenant. Recommendations for follow-up actions on these issues are as follows: (1) define the extent of contamination in the Devonian aquifer to the east, (2) evaluate the potential for vapor intrusion, (3) sample sediments and surface water of Dry Run Creek and amend the Operation and Maintenance (O&M) Plan to include periodic sampling and (4) implement a uniform environmental covenant on the site property.

A protectiveness determination for the remedy at the Ralston site cannot be made until further information is obtained. This information will be obtained by conducting a vapor intrusion study and collecting and

evaluating sediment and surface water data from Dry Run Creek. It is expected that this evaluation will take approximately two years to complete, at which time a protectiveness determination may be made.

1.0 Introduction

The purpose of five-year reviews is to determine whether the remedy at a site is protective of human health and the environment. The methods, findings and conclusions of reviews are documented in five-year review reports. In addition, five-year review reports identify issues found during the review, if any, and recommendations to address them.

The Agency is preparing this five-year review pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) section 121(c) and the National Contingency Plan (NCP). CERCLA § 121 states:

> If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.

The Agency interpreted this requirement further in the NCP; 40 CFR § 300.430(f)(4)(ii) states:

> If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.

The EPA Region 7 has conducted a five-year review of the remedial actions implemented at the Ralston site in Linn County, Iowa. This review was conducted from January 2011 through May 2011. This report documents the results of the review.

This is the second five-year review for the site. The triggering action for this second statutory review is the completion date of the first five-year review which was May 18, 2006, as shown in the EPA's WasteLAN database. The five-year review is required because hazardous substances, pollutants or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure.

2.0 Site Chronology

Table 1 presents a summary of the major site events and relevant dates in the site chronology.

Table 1
Chronology of Site Events

EVENT	DATE
103(c) Notification	6/1/1981
Preliminary Assessment	10/2/1985
Preliminary Assessment 2	11/8/1988
Site Inspection	12/15/1989
Site listing on the state's Registry of Hazardous Substance or Hazardous Waste Disposal Sites filed with the Linn County Recorder	6/14/1990
EPA Administrative Order on Consent	11/27/1991
EPA Administrative Order on Consent	2/16/1993
Removal Assessment completed	8/12/1993
Engineering Evaluation/Cost Analysis completed	12/2/1993
Protective water source designation effective	11/13/1996
Removal actions completed	6/1997
Remedial Investigation/Feasibility Study reports completed	8/1998
Record of Decision signed	9/30/1999
EPA/IDNR Response Action Oversight and NPL Deferral Agreement	7/20/2000
IDNR Consent Order with Rockwell Collins	7/24/2000
Remedial Action Implementation Work Plan approved	10/10/2000
Remedial actions initiated with first semi-annual monitoring event	4/26/2001
Five-year review completed	5/18/2006

3.0 Background

3.1 Physical Characteristics

The Ralston site is located north of 228 Blairs Ferry Road, just south of Dry Run Creek, and about one-half mile east of C Avenue on the north side of Cedar Rapids, Linn County, Iowa. The site was formerly used for industrial waste disposal. The disposal area occupies 1.5 acres and is enclosed with a fence with a locked gate.

The topography of the disposal area is characterized by the steeply sloping banks of Dry Run Creek to the north and a railroad embankment to the south. Previous Superfund removal actions have modified the general site topography by raising and leveling the disposal area. A minimum of two feet of

compacted clay and two feet of topsoil were placed as a cap over the surface of the former disposal area to prevent precipitation infiltration. Terraces, drainage channels and an access road were subsequently constructed on top of the cap to prevent cap erosion and improve access.

The topography of the southern creek bank of Dry Run Creek, which forms the northern boundary of the disposal area, was also modified by removal actions implemented at the site. A total of 13,400 square feet of geomembrane liner and 17,840 square feet of cable-concrete mats was placed on the creek bank to protect the disposal area and clay cap from surface water erosion associated with the creek. Cable-concrete mats were also placed under the creek crossing to provide a resistant and stable surface upon which to cross the creek.

The geology of the site vicinity generally consists of unconsolidated Quaternary-age alluvial deposits overlying Devonian and Silurian carbonate bedrock. Unconsolidated deposits at the site near Dry Run Creek consist of a thin layer of topsoil and clayey to sandy silt overlying fine to medium sand.

Three principal aquifers are present at the site: (1) the Quaternary alluvial aquifer, (2) the Devonian aquifer and (3) the Silurian aquifer. The alluvial aquifer at the Ralston site is approximately ten feet to fifteen feet thick and consists of groundwater flow in the alluvial sands and gravel near Dry Run Creek. Under normal conditions, shallow groundwater flow from the disposal area is oriented primarily to the northeast toward the creek. North of the disposal area, shallow groundwater flow is radially southward from upland areas toward the channel of Dry Run Creek.

At a depth below the ground surface of 20 to 50 feet, Devonian-age dolomite bedrock of the Otis and Bertram formations is encountered. In the Devonian aquifer, the groundwater flow is in both the northeast and southeast directions from the site. The Silurian-age Scotch Grove formation is encountered throughout the site vicinity at a depth below the ground surface of 110 to 140 feet. Groundwater flow in the Silurian aquifer is predominantly horizontal with little or no component of vertical groundwater flow. The horizontal direction of groundwater flow is generally southward with some variation. Downward vertical gradients were measured between nested wells installed in the alluvial, Devonian, and Silurian aquifers. Near the creek channel, more pronounced vertical solution weathering in the bedrock aquifers may indicate an area of increased downward migration of contaminants.

Several private and public water supply wells exist within two miles of the site. Originally, six private wells existed within one mile of the site. Two private wells have since been abandoned and the residences were connected to the public water supply. Available well construction information indicates most of these water supply wells are greater than 150 feet deep, cased through the unconsolidated and upper bedrock deposits, and open to lower Devonian and/or Silurian rocks. The city of Marion uses two wells which tap the Silurian aquifer approximately one mile east of the Ralston site. The Cedar Rapids water supply wells are located in alluvial sand and gravel deposits. They are generally 60 to 70 feet deep and located close to the Cedar River, several miles southwest of the Ralston site.

3.2 Land and Resource Use

The disposal area is fenced and will continue to be fenced. It is accessible through a locked gate. Rockwell Collins has stated it will continue to own this property in the future and will restrict access to the disposal area to those who have a need to monitor and maintain it. There are no environmental covenants on this property. The area immediately surrounding the disposal area is zoned for residential/agricultural use.

There are commercial properties within 500 feet of the disposal area to the south. Residential developments exist north and west of the disposal area. The developments have reached the property owned by Rockwell Collins. It is possible that there will be further commercial and residential development in areas outside of the disposal area.

Four private wells are still in use in the vicinity of the site. They are identified as the Finley, Thurness, Foster and Grabau wells. The Finley and Thurness wells are reported to be used for irrigation, the Grabau well for watering livestock and the Foster well as a drinking water supply. During development of the Remedial Action Implementation Work Plan the Finley and Thurness wells were identified as either being near or potentially downgradient of the site in the bedrock aquifer. It was planned for these wells to be sampled semiannually. The other two wells were identified as being within the vicinity of the site and were planned to be sampled annually. None of the contaminants of concern have been detected in any of these wells above a detection limit during the past five years.

3.3 History of Contamination

From about 1956 to 1958, the Ralston site was used by Rockwell Collins as a disposal area for wastes generated from a pilot gold-plating operation and other industrial sources. The amount of solid and liquid wastes that were disposed of at the site is not known; however, it has been estimated that 60,000 gallons of liquid waste may have been disposed of during the years of plating operation. The wastes were typically burned and spread in layers, as necessary, to accommodate additional wastes. The types of wastes disposed of at the site by Rockwell Collins included solvents, paint sludge and general industrial refuse including scrap metal, office furniture and construction and demolition debris. The Ralston disposal site was not restricted solely for Rockwell Collins' use. Other local businesses or citizens likely disposed of other solid waste at the site.

In addition to the industrial-type wastes already mentioned, the Ralston site was also used for the disposal of cyanide wastes (salts of ferrocyanide compounds) from the plating operation. The cyanide wastes were initially placed in 5-gallon containers. Two 5-gallon containers were then placed in a 55-gallon drum and encapsulated in concrete. An undetermined number of concrete-encapsulated cyanide drums were disposed of at the site. As stated previously, Rockwell Collins was able to find only two drums of concrete-encapsulated cyanide wastes during investigations at the site.

3.4 Initial Response

In December 1981, Rockwell Collins submitted a CERCLA section 103(c) notice to the EPA, which listed hazardous substances disposed of at the Ralston site as solvents, paint sludge and buried drums of concrete-encapsulated cyanide. In this notice, Rockwell Collins estimated that 60,000 gallons of liquid wastes were generated and disposed of during the years of its plating operation, and an undetermined number of concrete-encapsulated cyanide drums were buried at the site.

In May 1985, a contractor for the EPA conducted a preliminary assessment of the Ralston site. The assessment indicated that groundwater and surface water contamination may have resulted from the previous disposal activities, and a site inspection was recommended.

In 1989, Rockwell Collins removed and properly disposed of two drums of concrete-encapsulated cyanide. No other drums were located.

In November 1990, Rockwell Collins conducted an additional investigation at the site under the oversight of an EPA contractor. Six trenches were excavated and shallow soil borings were installed on a 50-foot-by-50-foot grid system for the purpose of collecting soil samples for laboratory analyses of volatile organic compounds (VOCs), including trichloroethene (TCE) and metals. The results of this investigation were reported in a document entitled, "Report for Investigation of the Ralston Site, Blairs Ferry Road, January 1991."

On December 4, 1991, Rockwell Collins and the EPA entered into an Administrative Order on Consent to conduct a Remedial Investigation and Feasibility Study (RI/FS) at the Ralston site. The goal of the RI/FS was to investigate the extent of soil and groundwater contamination at the site and to determine an appropriate remedy or remedies.

To accelerate the cleanup of the disposal area and shallow groundwater, on January 22, 1993, Rockwell Collins and the EPA entered into a second Administrative Order on Consent to conduct a removal site evaluation, engineering evaluation/cost analysis and a removal action. The removal action took place while work continued on the RI/FS.

The removal actions implemented at the Ralston site included the following:

- Capping of the former disposal area;
- Stabilizing the bank of Dry Run Creek to prevent erosion at the site;
- Installation and operation of a dual vapor extraction (DVE) and treatment system; and
- Extracting and treating alluvial (shallow) groundwater located north of Dry Run Creek.

Capping of the disposal area and stabilization of the creek bank were completed in December 1995. The DVE system began full-time operation in April 1995 and operated periodically until June 1997. At that time, it was determined that it was no longer effectively removing additional source contamination. More than 4,800 pounds of VOCs were removed and treated with the DVE and treatment system.

3.5 Basis for Taking Action

A baseline risk assessment was conducted as a part of the remedial investigation. It included a human health risk assessment and a qualitative ecological risk assessment. The human health exposure scenarios that were evaluated in the risk assessment included exposures to contaminated surface soil, groundwater, sediment and surface water. Due to the implementation of the removal actions and institutional and engineering controls, the only exposure pathways which were still considered viable at the time of the ROD involved exposure to groundwater through ingestion or inhalation of vapors during household use by a resident. In the ROD, the following contaminants were identified as contaminants of concern for groundwater: benzene; 1,1-dichlorothene; cis-1,2-dichloroethene (cis-1,1-DCE); TCE and vinyl chloride.

It was noted in the ROD that although potential ecological risks to site vegetation, the terrestrial food web and the aquatic life in Dry Run Creek were identified, the uncertainties of these risks were high due to the qualitative nature of the ecological risk assessment. However, it was also noted that implementation of the removal actions that took place at the site significantly reduced or eliminated any threat to site vegetation, the terrestrial food web or the aquatic life in Dry Run Creek.

4.0 Remedial Actions

4.1 Remedy Selection

The ROD for the Ralston site was signed on September 30, 1999. Remedial action objectives (RAOs) were developed during the feasibility study using data collected during the remedial investigation, to aid in the development and screening of remedial alternatives that were considered for the ROD. Separate RAOs were developed for soil and groundwater. The RAO for soil was the prevention or minimization of direct contact exposures (inhalation, dermal contact, ingestion, etc.) with soil having a carcinogenic risk in excess of $1x10^{-4}$ or a hazard index for noncarcinogens greater than 1. Specific soil cleanup criteria were not established for the site because the removal actions had eliminated exposure to soil which exceeded these threshold levels.

The RAO for groundwater was the prevention of ingestion of or direct contact with groundwater having a carcinogenic risk in excess of $1x10^{-4}$ and/or a hazard index for noncarcinogens greater than 1. The EPA's Maximum Contaminant Levels (MCLs) from the Safe Drinking Water Act for public water supplies were identified as applicable or relevant and appropriate requirements (ARARs) for this site. The cleanup levels for groundwater at the site were the MCLs, expressed in micrograms per liter (µg/l), which are as follows:

Contaminant	MCL, in µg/l
Benzene	5
1,1-Dichloroethene	7
Cis-1,2-Dichloroethene	70
Trichloroethene	5
Vinyl chloride	2

It was noted in the ROD that achieving MCLs in the disposal area may not be possible due to the likelihood that contaminants are present in that area as a dense nonaqueous phase liquid.

The selected remedy in the ROD included monitored natural attenuation of groundwater, institutional controls and maintenance of the disposal area cap and creek bank stabilization.

As stated in the ROD, the institutional controls implemented at the Ralston site include:

(1) Continued ownership by Rockwell Collins of the fenced area, including the disposal area. The area is zoned for residential/agricultural use. The only access to the disposal area is through a locked gate, thus restricting access by trespassers.

(2) Listing of the site on the Registry of Hazardous Waste or Hazardous Substance Disposal Sites pursuant to Iowa Administrative Code 455B.426. Pursuant to Subrule 567, Iowa Administrative Code 148.6(5), written approval of the director of the IDNR is required prior to any substantial change in the use of the listed site. In addition, written approval is also required to sell, convey or transfer title of the listed site.

(3) A 1-mile area surrounding the site has been designated as a protected source area pursuant to Rule 567 Iowa Administrative Code 53.7(455B). According to the promulgated rule, any new application for a permit to withdraw groundwater or to increase an existing permitted

withdrawal of groundwater from within the protected water source area will be restricted or denied, if necessary, to preserve public health and welfare or to minimize movement of groundwater contaminants from the Ralston Site. IDNR coordinates with the Linn County Health Department, the local well permitting authority, to enforce this institutional control.

An element of the selected remedy was monitored natural attenuation of the groundwater. Data collected at the site prior to selection of the remedy indicated that intrinsic bioremediation of the contaminants of concern was occurring in the disposal area and in areas downgradient in the alluvial, Devonian and Silurian aquifers. The data suggested that intrinsic biodegradation would occur at a predictable rate in the future and degrade TCE and associated breakdown products by 50 percent every six months to two years. Groundwater samples were to be collected from monitoring wells and private wells. These water samples were to be analyzed for VOCs as well as other parameters to determine the continued effectiveness of the bioremediation processes.

The selected remedial actions include maintenance of the cap and the creek bank. The cap and the creek bank were to be visually inspected periodically to verify the integrity and performance of the materials. The cap and the creek bank were to be regularly maintained, including mowing, revegetation and repair as needed to ensure long-term reliability.

4.2 Remedy Implementation

On July 20, 2000, the EPA and IDNR entered into an agreement entitled the Response Action Oversight and NPL Deferral Agreement for the Ralston Superfund Site, Cedar Rapids, Iowa. Pursuant to this agreement, IDNR agreed to assume responsibility for overseeing the response actions at the Ralston site and implementation of the ROD. Further, the EPA agreed to defer consideration of listing the Ralston site on the National Priorities List (NPL), and, when the response actions are complete, to no longer consider the site for the NPL unless new information suggests the existence of a significant threat to human health or the environment.

On July 24, 2000, IDNR entered into Consent Order No. 00-HC-05 with Rockwell Collins in which Rockwell Collins agreed to perform the work prescribed in the ROD under the oversight of IDNR.

Rockwell Collins prepared a Remedial Action Implementation Work Plan that was approved by IDNR on October 10, 2000. Rockwell Collins began implementation of the work plan, consisting of groundwater monitoring and site inspections, in April 2001.

During the remedial action, groundwater monitoring has been conducted in 19 monitoring wells and 4 private wells. The locations of the monitoring wells are shown in Figure 2; the locations of the private wells are shown in Figure 3. Monitoring wells in five geologic zones, both on-site and downgradient of the disposal area, have been sampled. Four wells in the alluvial aquifer have been sampled: MW-1A, MW-2A, MW-3A and MW-4A. Five wells in the Devonian bedrock aquifer have been sampled: MW-1B, MW-2B, MW-3B, MW-4B and MW-9B. The Silurian bedrock aquifer is monitored in three zones. The uppermost of the three zones is the Upper Scotch Grove formation of the Silurian aquifer and the wells in this zone are MW-1C, MW-3C and MW-4C. The next deepest zone is the Lower Scotch Grove formation of the Silurian aquifer and the wells in this zone are MW-1D, MW-3D, MW-5D, MW-7D, MW-8D and MW-9D. The deepest zone sampled is the Hopkinton formation of the Silurian aquifer and the well in this zone is MW-3E. These monitoring wells were sampled semiannually in April and October from 2001 through 2005. Beginning in April 2006 to the present, the monitoring wells have been sampled annually.

Two of the four private wells have been sampled semiannually in April and October since 2001. These are the private wells closest to the site. The other two private wells have been sampled annually in April of each year since 2001.

The disposal area cap and the creek bank stabilization were inspected and maintained quarterly from 2001 through 2005. Since 2006, this inspection and maintenance has occurred semiannually.

4.3 Systems Operation and Maintenance

The plans for long-term monitoring, operation and maintenance (O&M) of the remedial activities are documented in the Remedial Action Implementation Work Plan. The operation and maintenance activities have included:

- annual sampling of 19 monitoring wells for the COCs
- semiannual sampling of two private wells for the COCs
- annual sampling of two private wells for the COCs
- biennial sampling for natural attenuation parameters
- maintaining the fence, including gates and locks, around the disposal area
- removing deep-rooted growth that would damage the structures
- removing debris from the creek channel
- repairing any exposed geomembrane liner
- repairing slope failure or creep either around the cap or the creek bank
- repairing damage to the cap or cabled-concrete mat that could result in erosion or failure of these structures
- mowing and maintaining the vegetative cover

Maintenance activities have been reported in annual reports. Attachment A lists the annual O&M costs for the site for the past five years as provided by Rockwell Collins. These costs include all of the maintenance items listed above as well as the costs for groundwater sampling and analysis and report preparation. The estimate of O&M costs that was included in the cost of the remedy in the ROD was $32,780 per year and included all of the same elements. The O&M costs for the past five years have been very close to the estimated amount, averaging $30,175 per year.

5.0 Progress Since Last Review

The protectiveness statement in the first Five-Year Review Report for the site was as follows:

The remedy at the Ralston site is protective of human health and the environment because there is no exposure to site-related contaminants and institutional controls are in place to effectively prevent future exposures.

The recommendations made in the first Five-Year Review Report included:

- Continue monitoring of 16 monitoring wells. (Note: 19 wells are actually monitored at the site.)
- Continue monitoring of private wells.
- Continue conducting site inspections.
- Continue to monitor institutional control.

Over the past five years, Rockwell Collins has continued to sample the monitoring wells annually for the contaminants of concern and biennially for the natural attenuation parameters. Two of the private wells have been sampled for the contaminants of concern semiannually, while the other two private wells have been sampled annually. The site has been inspected semiannually and any problems identified have been addressed. Rockwell Collins has continued to ensure that the institutional controls remain in place. Annual reports of the activities at the site have been submitted to IDNR. IDNR continues to oversee the remedial actions at the site.

6.0 Five-Year Review Process

6.1 Administrative Components

The five-year review process was initiated on January 5, 2011, with a meeting of the team of people who would be working on the review. The team working on this five-year review includes the EPA Remedial Project Manager, Diana Engeman; IDNR Project Manager, Robert Drustrup; additional EPA technical staff; community involvement coordinators and legal staff. Representatives of Rockwell Collins and their consultant, MWH, provided information necessary to conduct this five-year review.

6.2 Community Involvement

On March 12, 2011, a public notice regarding the start of the second five-year review was published in the Cedar Rapids Gazette. A fact sheet announcing the start of the second five-year review was emailed to federal and state congressional offices on March 7, 2011, and mailed to local interested parties on March 11, 2011. Local interested parties include city and county officials, local organizations and citizens who have expressed an interest in the site. In general, the community interest in the Ralston site has been low. There have been no comments or questions provided to the EPA from the public during this five-year review.

Soon after approval of this Second Five-Year Review Report, a notice will be placed in the same newspaper announcing that the report is complete, and that it is available to the public at the Cedar Rapids Public Library in Cedar Rapids, Iowa, and the EPA Region 7 office.

6.3 Document Review

This five-year review consisted of a review of relevant documents, including the Remedial Action Implementation Work Plan and Remedial Action Activity Reports for 2006 through 2010. A complete list of documents reviewed as part of the five-year review process is included in Attachment B.

6.4 Data Review and Evaluation

Groundwater monitoring data have been collected at the Ralston site by Rockwell Collins in accordance with the Remedial Action Implementation Work Plan, Former Ralston Disposal Site, Cedar Rapids, Iowa, September 2000, as modified. Attachment C includes a compilation of these data. Figure 2 is a site map showing the location of the monitoring wells.

The A-series monitoring wells are in the unconsolidated alluvium of Dry Run Creek, with the flow direction from the disposal area predominantly to the northeast, toward the creek. Historically, the well upgradient of the disposal area, MW-1A, and the side gradient well, MW-2A, have shown significant decreases in contaminants, especially TCE and cis-1,2-DCE. These wells continue to have levels of these contaminants below MCLs and vinyl chloride is not detectable in these wells. MW-3A, which is immediately downgradient of the disposal area, continues to be very heavily contaminated with no discernable trends. MW-4A, which is further downgradient of the disposal area, is uncontaminated, with concentrations of all COCs below MCLs. Benzene was only found above detection limits in one alluvial well, MW-3A. The benzene level exceeded the MCL of 5 µg/l once, in April 2009 at 14.9 µg/l. It has been reported that previous investigations demonstrated that discharge from the alluvium to Dry Run Creek at the Ralston site causes negligible impact to the creek. However, there are no recent surface water or sediment samples to confirm that this is still the case.

Monitoring results from the next deeper B-series monitoring wells in the Devonian bedrock aquifer have shown more variability. During the past five years, the flow direction in the Devonian aquifer was predominantly to the east-northeast. This is a change in flow direction from the time the remedial investigation was conducted when the flow in the Devonian aquifer was primarily to the southeast. The reason for this change in flow direction has not been given. A decrease in the concentration of TCE has been observed in monitoring well MW-3B, which is immediately downgradient of the disposal area, along with small-to-moderate increases in the concentrations of cis-1,2-DCE. At MW-2B, which is side gradient to the disposal area, the concentrations of cis-1,2-DCE and vinyl chloride appear to be stable to decreasing after a rise noted during the previous five-year review. Contaminant levels in MW-9B, which is located about 500 feet southeast of the disposal area, have been more variable than the other Devonian wells. The concentrations of TCE, although detectable, have been below the MCL for the past five years. Concentrations of cis-1,2-DCE have varied from 19.1 to 981 µg/l. The concentration of vinyl chloride has consistently been above the MCL of 2 µg/l. MW-4B, which is side gradient to the disposal area, is uncontaminated. MW-3B is the only Devonian aquifer well with detectable levels of benzene. The levels of benzene in this well have consistently been above the MCL for the past five years.

The C- and D-series monitoring wells are completed in the Upper and Lower Scotch Grove formation of the Silurian bedrock aquifer. Flow direction in the Scotch Grove formation has varied from southeasterly to southwesterly in the past five years with southeasterly flow being most frequent. Very little contamination of the Scotch Grove Formation has been detected outside of the site itself in the upper formation, i.e., MW-1C. Contaminant levels have been fairly stable in MW-1C and MW-3C, the only two C-series wells with significant contamination, except for gradual increases of cis-1,2-DCE in MW-1C, which is indicative of

natural attenuation occurring. MW-4C is upgradient of the disposal area and is uncontaminated. Only low levels of contamination have been found in the D-series wells. The concentrations of TCE and cis-1,2-DCE found in MW-1D have exceeded their respective MCLs for the past three years. MW-3D had a concentration of 1.95 µg/l of vinyl chloride for the first time in 2010. MW-9D has exhibited stable concentrations of TCE and cis-1,2-DCE that are below the MCLs for the past five years. MW-3C is the only Scotch Grove formation well with benzene concentrations above the detection limits. The concentration of benzene in MW-3C has been around 100 µg/l for the past five years.

One monitoring well is completed in the underlying Hopkinton formation of the Silurian bedrock aquifer. This well, MW-3E, located near the disposal area, has not shown the presence of contamination.

In addition to sampling monitoring wells for the contaminants of concern, the wells are sampled biennially for the following natural attenuation parameters: nitrate as nitrogen, sulfate, total organic carbon, methane, ethene, ethane, dissolved iron and dissolved manganese. These parameters are indicators that conditions in the subsurface are favorable for intrinsic bioremediation to occur or that it has taken place. This information, as well as contaminant concentration and other hydrogeologic information, can be used to assess whether intrinsic bioremediation is occurring, and, if so, at what rate it might be expected to occur. The 2010 Annual Report includes the most recent analysis of the natural attenuation data. Twelve wells had detectable concentrations of methane, up from five wells in 2008. Three wells had detectable concentrations of ethane in 2010, consistent with the 2008 results. These data indicate that reductive dechlorination is occurring. In addition, the pH and dissolved oxygen measurements, as well as total organic carbon and electron donor data, indicate the environment is conducive to supporting biodegradation processes.

In conclusion, groundwater monitoring at the Ralston site has generally demonstrated stable or improving conditions. In the Devonian aquifer (B-series) monitoring wells, it is not clearly demonstrated that the extent of contamination has been defined to the east of MW-3B or MW-9B. Natural attenuation monitoring parameters coupled with contaminant concentration information, generally demonstrate that natural attenuation is occurring. Except for uncertainty in the Devonian aquifer, monitoring data demonstrate that the extent of contamination is expanding neither horizontally nor vertically.

The monitoring results from four private wells since April 2001 have revealed no detectable contamination associated with the Ralston site, except for occasional vinyl chloride in the Thurness well at levels below the MCL. Detectable levels of vinyl chloride have not been found in this well since October 2005. Table 4-7 from the 2010 Annual Report is a historic summary of results from the Thurness well (included as Attachment D). From 1993 through 1997, low levels of TCE and cis-1,2-DCE were found in the Thurness well. Samples from 1998 through 2010 did not reveal any detectable contamination.

Semiannual inspections of the site are conducted by Rockwell Collins personnel and include inspecting the condition of the cap and creek bank stabilization. They also ensure that the fence that restricts access to the disposal area is in good condition and that the gate is locked. The environmental contractor employed by Rockwell Collins inspects the site annually and completes a Field Inspection Sheet, which is included with each annual report. They also verify that all monitoring wells are in good condition as they are conducting the groundwater sampling. During the past five years, only minor problems such as a tree limb falling on the fence, saplings growing along the area with creek bank stabilization and repair to the bumper protecting a monitoring well have been noted and addressed.

6.5 Site Inspection

An inspection to assess the conditions of the site was conducted on April 14, 2011. Participating in the inspection were EPA Remedial Project Manager, Diana Engeman; IDNR's Greg Fuhrmann; Rockwell Collins Director of Environment, Safety and Health Operations, Tom Gentner; Rockwell Collins Manager of Facility Operations, Mike Stadtmueller; and MWH's Steve Varsa. The visit began by meeting in the Rockwell Collins' office to discuss the schedule for completion of the five-year review and potential issues and recommendations that may be included in the report. After the meeting, the group went to the disposal area to view the site and then to the location of one of the residential wells that is sampled semiannually. Everything at the site was found to be in good condition. Rockwell Collins representatives indicated that they will be installing a fence along the western edge of the property they own outside of the disposal area because the residential property owners are beginning to encroach on that property. This encroachment is not near the disposal area. The Site Inspection Report is Attachment E to this report.

7.0 Technical Assessment

7.1 Question A: Is the remedy functioning as intended by the decision documents?

Yes. The selected remedy in the ROD included monitored natural attenuation of groundwater, institutional controls and maintenance of the disposal area cap and creek bank stabilization.

For the past five years the groundwater has been monitored annually for the contaminants of concern and biennially for the natural attenuation parameters. In addition to the 19 monitoring wells at the site, 2 private wells have been sampled semiannually and 2 private wells have been sampled annually for the contaminants of concern.

The institutional controls were all implemented prior to the ROD. The EPA verified in March 2011 that the disposal area remains under the ownership of Rockwell Collins. It was observed during the site inspection that the disposal area is fenced, with a locked gate, limiting access by the public. The EPA also verified that the Ralston site remains on the state Registry of Hazardous Waste or Hazardous Substance Disposal Sites. In addition, the Ralston site continues to be designated by rule as a protected water source area pursuant to Subrule 567, Iowa Administrative Code 53.7(1). The state legislature has enacted amendments to the Iowa Adminstrative Code covering the state registry that will become effective on July 1, 2011. These amendments include a provision that, in the event a uniform environmental covenant is executed for a site, the contaminated portions of the property may be removed from the registry. Implementation of a uniform environmental covenant for the portion of the property owned by Rockwell Collins that comprises the site would be a more enforceable institutional control than listing it on the registry for the long term.

Rockwell Collins reports that they have queried the Linn County Health Department annually regarding permit applications for private wells within the designated protected water source area. In February 2006, the first such application was received for closed-loop heat pump wells about one-half of a mile west of the site. Due to the upgradient location and the fact that the wells would not extract water, the health department granted a permit. Ultimately, these wells were never installed. There have not been any well permit applications within the designated protected water source area since that time.

The cable/concrete mat creek bank stabilization is inspected twice a year and continues to be in excellent condition. It continues to maintain the creek bank without any signs of erosion.

The disposal area is secured behind a fence with a locked gate. The cap is in excellent condition, with no signs of erosion or ponding of water, and it has a thick grass cover.

7.2 Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy still valid?

Changes in Standards and To Be Considers (TBCs)

- *Have there been changes to risk-based cleanup levels or standards identified as ARARs in the ROD that call into question the protectiveness of the remedy?*

  The ROD only established cleanup levels for groundwater because contaminated soil from the disposal area was capped with two feet of compacted clay and two feet of soil. The groundwater cleanup goals were based on the federal MCLs. The MCLs for the contaminants of concern have not changed since the ROD was issued in September 1999.

  Exposure assumptions, toxicity data, cleanup levels and RAOs were not selected specifically to address ecological risk at the site. Although the removal action involved capping of the disposal area and stream bank stabilization, there have not been any samples collected of the surface water and sediment in Dry Run Creek to confirm whether these actions have been protective for ecological receptors in the creek. Collection and analysis of surface water and sediment samples would be necessary to make that determination.

- *Are there newly promulgated standards that call into question the protectiveness of the remedy?* No.

- *Have TBCs used in selecting cleanup levels at the site changed in ways that could affect the protectiveness of the remedy?*

  TBCs were not used in selecting cleanup levels for this site.

Changes in Exposure Pathways

- *Has land use or expected land use on or near the site changed (e.g., industrial to residential, commercial to residential)?*

  Land use has not changed at the site. The change in potential future land use known at this time is the property known as the Bauer residence which has been put up for sale by the property owner for commercial use. A sale is currently pending but has not been completed. This property is located approximately 500 feet south of the disposal area.

- *Have any human health or ecological routes of exposure or receptors changed or been newly identified (e.g., dermal contact where none previously existed, new populations or species identified on-site or near the site) that could affect the protectiveness of the remedy?*

  As discussed below under Question C, subsurface vapor intrusion has been identified as an additional potential exposure pathway which was not evaluated in the past at this site. In addition, the human health risk assessment did not account for dermal contact with contaminated

groundwater by current and future residential receptors. However, inclusion of this pathway would not affect the protectiveness of the remedy because no individuals are using contaminated groundwater and installation of new wells is protected within one mile of the source area.

- *Are there newly identified contaminants or contaminant sources?*

  The available data do not demonstrate new contaminants or contaminant sources.

- *Are there unanticipated toxic byproducts of the remedy not previously addressed by the decision documents (e.g., byproducts not evaluated at the time of remedy selection)?* There are no known unanticipated toxic byproducts.

- *Have physical site conditions (e.g., changes in anticipated direction or rate of groundwater flow) or the understanding of these conditions (e.g., changes in anticipated direction or rate of groundwater flow) changed in a way that could affect the protectiveness of the remedy?*

  The flow direction in the Devonian aquifer has changed since the investigations conducted prior to the ROD. It is no longer clear that the extent of contamination in this aquifer is fully defined.

Changes in Toxicity and Other Contaminant Characteristics

- *Have toxicity factors for contaminants of concern at the site changed in a way that could affect the protectiveness of the remedy?*

  Numerous toxicity values have changed since the baseline human health risk assessment was completed in October 1994. These changes have no impact on the remedy for soil because direct contact has been eliminated through a clay and soil cap. In terms of groundwater, no one is currently using the contaminated groundwater as a domestic source and the remedy prevents future exposure because a one-mile area surrounding the site has been designated as a protected source area pursuant to Iowa Administrative Code 567-53.7(455B), and any new wells in the designated area must be approved by state authorities. Thus, these changes do not impact the protectiveness of the remedy for soil and groundwater.

  The exposure point concentrations for sediment and surface water from the human health risk assessment were compared to the most recent Regional Screening Levels (RSLs) for residential soil and tap water, because the RSLs generally contain the latest toxicity values (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/index.htm). This comparison is a health-protective approach because the residential soil and tap water RSLs are based on residential exposures which are much greater than the recreational user scenario evaluated in the site-specific risk assessment. This comparison indicates that none of the compounds detected in Dry Run Creek pose a significant risk to human health and any changes to toxicity values do not affect the protectiveness of the remedy for sediment and surface water.

  It is unknown whether any contaminants related to the site are currently in the sediments or surface water of Dry Run Creek as there have not been any samples collected since prior to the ROD. However, it was recognized that the alluvial aquifer was in communication with Dry Run Creek at times. Confirmation samples of the sediment and surface water could verify that the remedy chosen is protective of Dry Run Creek. These confirmation samples should be analyzed for the VOC contaminants of concerns as well as total polychlorinated biphenyls (PCBs), PCB

Arochlor 1260, dichlorodiphenyltrichloroethane (DDT), metals and cyanides. PCBs and DDT were never sampled for in the sediment but were found in soil samples from the disposal area. If they are present in the sediments of Dry Run Creek they may pose an ecological risk due to their potential to biomagnify through the food chain.

- *Have other contaminant characteristics changed in a way that could affect protectiveness of the remedy?*

  There are no other known changes to contaminant characteristics that could impact the protectiveness of the remedy.

Changes in Risk Assessment Methods

- *Have standardized risk assessment methodologies changed in a way that could affect the protectiveness of the remedy?*

  The overall approach for conducting the human health risk assessment is comparable to current risk assessment practice in Region 7. As mentioned previously, currently methodology quantifies dermal contact with contaminated water while showering and bathing, which was not done in this human health risk assessment. Also, the EPA has more recent guidance on quantifying exposure for both the dermal and inhalation routes of exposure. Furthermore, a few exposure parameters used in the human health risk assessment for this site are different than values currently used (i.e., skin surface area, inhalation rate). Overall, these changes do not have a significant impact on the conclusions of the risk assessment, nor do they affect the protectiveness of the remedy.

  The 1994 Ecological Risk Assessment (ERA) for the site was adequate. However, in 1997, the EPA published Interim Final Ecological Risk Assessment Guidance for Superfund. Although the ERA for the site was referred to as a baseline risk assessment, it was actually a screening level ERA (refer to steps 1, 2 and 3 of the 1997 ERA guidance). A screening level risk assessment was the appropriate action to take at the Ralston site. The ERA is still considered adequate because it contained all three steps in the 1997 guidance. Confirmed ecological risks and potential ecological risks were found at the site via the assessment that was performed. The next step in conducting an ERA, as described in the 1997 ERA guidance, would be to conduct a baseline ERA, bringing unknown and known COCs forward and performing a more in-depth ERA. Rather than going through this process at the Ralston site, the creek bank was stabilized with a geomembrane underneath, a creek crossing was installed and the disposal area was capped. Action levels were not developed for creek sediment or surface water, nor were any confirmation samples collected. Ongoing monitoring of the creek has not occured to demonstrate that, due to the actions taken, the sediment and surface water do not pose a risk to aquatic organisms. Collection of sediment and surface water samples would need to be collected, analyzed and compared to appropriate ecological screening levels to make that determination.

Evaluation of Remedial Action Objectives

Separate RAOs were developed for soil and groundwater. The RAO for soil was the prevention or minimization of direct contact exposures (inhalation, dermal contact, ingestion, etc.) with soil having a carcinogenic risk in excess of $1x10^{-4}$ or a hazard index for noncarcinogens greater than 1. The contaminated soil in the disposal area was capped and the area was fenced as part of a removal action. The bank of Dry Run Creek was stabilized as part of that action. The remedy in the ROD includes on-going maintenance of the cap, creek bank stabilization and the fence to prevent direct contact exposure to contaminated soil. The remedy is achieving this RAO.

The RAO for groundwater was the prevention of ingestion of or direct contact with groundwater having a carcinogenic risk in excess of $1x10^{-4}$ and/or a hazard index for noncarcinogens greater than 1. The implementation of the protected source area for groundwater in a 1-mile radius around the site prevents any changes to use of the groundwater in the vicinity of the site without an opportunity for regulators to determine whether anyone could be exposed. There are only four wells in the vicinity of the site that are known to be used for any purpose. These four wells are sampled regularly and there are no elevated levels of any of the contaminants of concern in these wells. At the time this RAO was developed, exposure to groundwater contamination through inhalation was only evaluated for showering or cooking. Vapor intrusion from the groundwater plume was not specifically considered during development of the groundwater RAO, although it is an inhalation exposure.

7.3 Question C: Has other information come to light that could call into question the effectiveness of the remedy?

In 2008, the Cedar Rapids area sustained significant flooding. Rockwell Collins reported that Dry Run Creek and the disposal area were not significantly impacted by this event.

The vapor intrusion pathway was not considered in the original remedial investigation or in the baseline risk assessment. The sampling results indicate that VOC-contaminated groundwater may underlie or be adjacent to buildings located south of the site on property not owned by Rockwell Collins. In May 2010, vinyl chloride and cis-1,2-DCE were detected in MW-9B at 17.8 and 205 µg/l, respectively. The vapor intrusion pathway should be fully evaluated using a multiple-lines-of-evidence approach, which may include the collection of additional environmental samples (e.g., soil gas, subslab gas, indoor air). Due to a lack of information, it is not possible to determine whether the remedy is protective for the vapor intrusion pathway.

Control of future uses of the disposal area are primarily the result of Rockwell Collins' commitment to ongoing ownership of the property and the notification to any future owner of the need to obtain written approval of the director of IDNR prior to any substantial change in the use of the property since it is listed on the state's Registry of Hazardous Waste or Hazardous Substance Disposal Sites. Placing an environmental covenant on the deed for this property consistent with the Uniform Environmental Covenants Act would provide a more permanent and enforceable means of imposing limitations on future use of the property.

7.4 Summary of Technical Assessment

The selected remedy in the ROD included monitored natural attenuation of groundwater, institutional controls and maintenance of the disposal area cap and creek bank stabilization. The disposal area cap and the creek bank stabilization that are to be maintained were implemented as part of a previous non-time-critical removal action.

Since implementation of the remedial action at the Ralston site, groundwater has been monitored in 19 monitoring wells, both on- and off-site. Initially, these wells were sampled semiannually for the contaminants of concern. For the past five years, they have been sampled annually. There are four A-series wells in the unconsolidated alluvium of Dry Run Creek. Two of these wells have experienced some of the most significant decreases in contamination at the site and the furthest downgradient well is no longer contaminated. The one A-series well located immediately downgradient of the disposal area continues to be heavily contaminated.

The next deepest monitoring wells are the five B-series wells in the Devonian bedrock aquifer. As described previously in this report, in some of these wells, concentrations of TCE have decreased, while the concentrations of cis-1,2-DCE and vinyl chloride have increased. These changes may be indicative of intrinsic bioremediation occurring, resulting in the reductive dechlorination of TCE to cis-1,2-DCE to vinyl chloride to ethene. Due to a change in groundwater flow direction in the Devonian aquifer since the remedial investigation was conducted from predominantly southeast to north northeast, it is not clearly demonstrated that the extent of contamination has been defined to the east of MW-3B or MW-9B in the Devonian aquifer.

There are a total of ten monitoring wells in three zones of the deeper Silurian bedrock aquifer. There are three C-series wells in the Upper Scotch Grove formation, six D-series wells in the Lower Scotch Grove formation and one well in the Hopkinton formation of the Silurian aquifer. The two C-series wells nearest the disposal area have had fairly steady levels of contamination for the past five years. The D-level wells have only exhibited low levels of contamination. The E-series well is uncontaminated.

In addition to sampling monitoring wells for the contaminants of concern, the wells are sampled biennially for several parameters which are indicators that conditions in the subsurface are favorable for intrinsic bioremediation to occur or that it has taken place. It has been demonstrated that natural attenuation is occurring at the Ralston site although it has not clearly described in annual reports how these data are used to reach that conclusion.

Groundwater monitoring at the Ralston site has generally demonstrated stable or improving conditions and, except for uncertainty in the B-series Devonian aquifer wells to the east, monitoring data demonstrate that the extent of contamination is expanding neither horizontally nor vertically.

Monitoring of four private wells since April 2001 has revealed no detectable contamination associated with the Ralston site, except for occasional vinyl chloride in the Thurness well at levels below the MCL.

The vapor intrusion exposure pathway has not been evaluated at the Ralston site. Since groundwater sampling results indicate that VOC-contaminated groundwater may underlie or be adjacent to buildings located south of the site, this pathway should be fully evaluated using a multiple-lines-of-evidence approach. Due to a lack of information, it is not possible to determine whether the remedy is protective for this pathway.

The sediments and surface water of Dry Run Creek have not been sampled since prior to the ROD. Therefore, it is not possible to determine whether there has been an impact to the creek from the site since implementation of the remedy. Periodic confirmation sampling of sediments and surface water for VOCs, PCBs, DDT, metals and cyanides would provide information needed to determine whether there has been any movement of contaminants from the disposal area into the creek.

For the past five years, semiannual inspections of the site were conducted by Rockwell Collins' personnel. They inspect the condition of the cap and creek bank stabilization, ensure that the fence, gates and locks are in good condition and verify that all monitoring wells are in good condition. During the past five years, only minor problems have been identified and addressed.

Three institutional controls have been identified for the Ralston site: continued ownership of the property by Rockwell Collins, listing of the site on the state's Registry of Hazardous Waste or Hazardous Substance Disposal Sites and designation of a 1-mile area surrounding the site as a protected source area for groundwater. Rockwell Collins has verified that they own the property surrounding the site, that the site continues to be listed on the state registry and that they check with the county health department annually regarding requests for well permits with the protected source area. During the past five years, a request for installation of nonpumping wells was approved, but it was later decided that the wells were not needed. It is recommended that Rockwell Collins place an environmental covenant on the deed for this property, consistent with the Uniform Environmental Covenants Act, which would provide a more permanent and enforceable means of imposing limitations on future use of the property than the current listing on the state registry.

8.0 Issues

Table 2

Issues	Affects Current Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
It is not clearly demonstrated that the extent of contamination has been defined to the east of MW-3B or MW-9B in the Devonian aquifer.	N	Y
The vapor intrusion exposure pathway has not been evaluated at the Ralston site.	*	*
The sediments and surface water of Dry Run Creek have not been sampled since prior to the ROD.	*	*
Listing on the state Registry of Hazardous Waste or Hazardous Substance Disposal Sites is not as enforceable as an environmental covenant.	N	Y

*Protectiveness determination deferred.

9.0 Recommendations and Follow-up Actions

Implementation of the following recommendations is necessary to address the issues identified in this five-year review. The recommendations will be implemented by Rockwell Collins with IDNR as the lead oversight agency and the EPA Region 7 as the support agency.

Table 3

Issue	Recommendations and Follow-up Actions	Party Responsible	Milestone Date	Follow-up Actions: Affects Protectiveness (Y/N)	
				Current	Future
It is not clearly demonstrated that the extent of contamination has been defined to the east of MW-3B or MW-9B in the Devonian aquifer.	Take actions, possibly including installation of monitoring wells to define the extent of groundwater contamination to the east in the Devonian aquifer.	Rockwell Collins/ IDNR	6/30/2013	N	Y
The vapor intrusion exposure pathway has not been evaluated at the Ralston site.	Evaluate potential for vapor intrusion utilizing multiple lines of evidence.	Rockwell Collins/ IDNR	6/30/2013	*	*
The sediments and surface water of Dry Run Creek have not been sampled since prior to the ROD.	Sample sediments and surface water of Dry Run Creek and amend O&M Plan to include periodic sampling.	Rockwell Collins/ IDNR	6/30/2012	*	*
Listing on the state Registry of Hazardous Waste or Hazardous Substance Disposal Sites is not as enforceable as an environmental covenant.	Implement Uniform Environmental Covenant on the site property.	Rockwell Collins/ IDNR/EPA	6/30/2012	N	Y

*Protectiveness determination deferred.

10.0 Protectiveness Statement

A protectiveness determination for the remedy at the Ralston site cannot be made until further information is obtained. This information will be obtained by conducting a vapor intrusion study and collecting and evaluating sediment and surface water data from Dry Run Creek. It is expected that this evaluation will take approximately two years to complete, at which time a protectiveness determination may be made.

11.0 Next Five-Year Review

The next five-year review for the Ralston site will be required in June 2016.

FIGURES

FIGURE 1
SITE LOCATION MAP

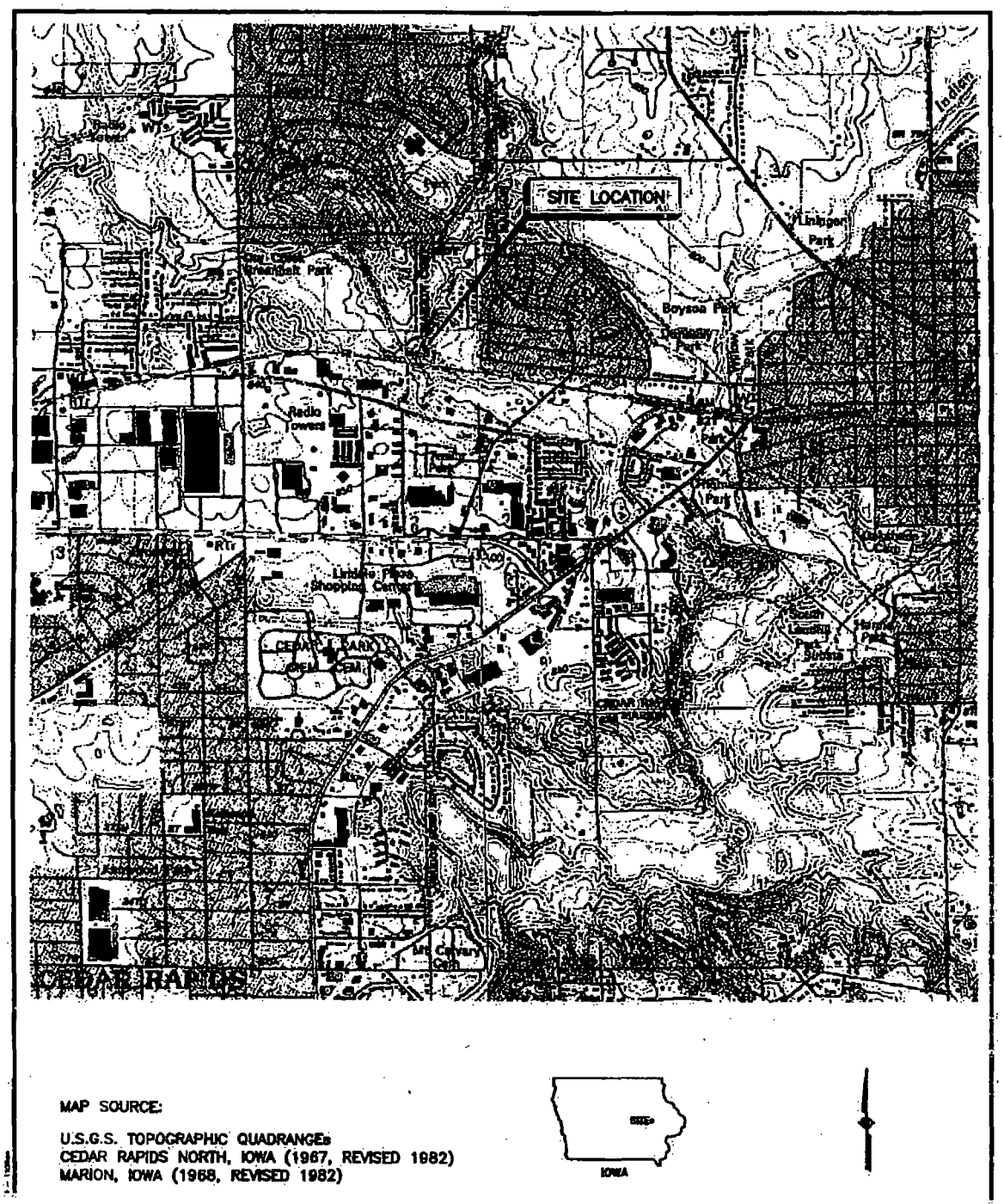


FIGURE 2
SITE LAYOUT AND OWNERSHIP

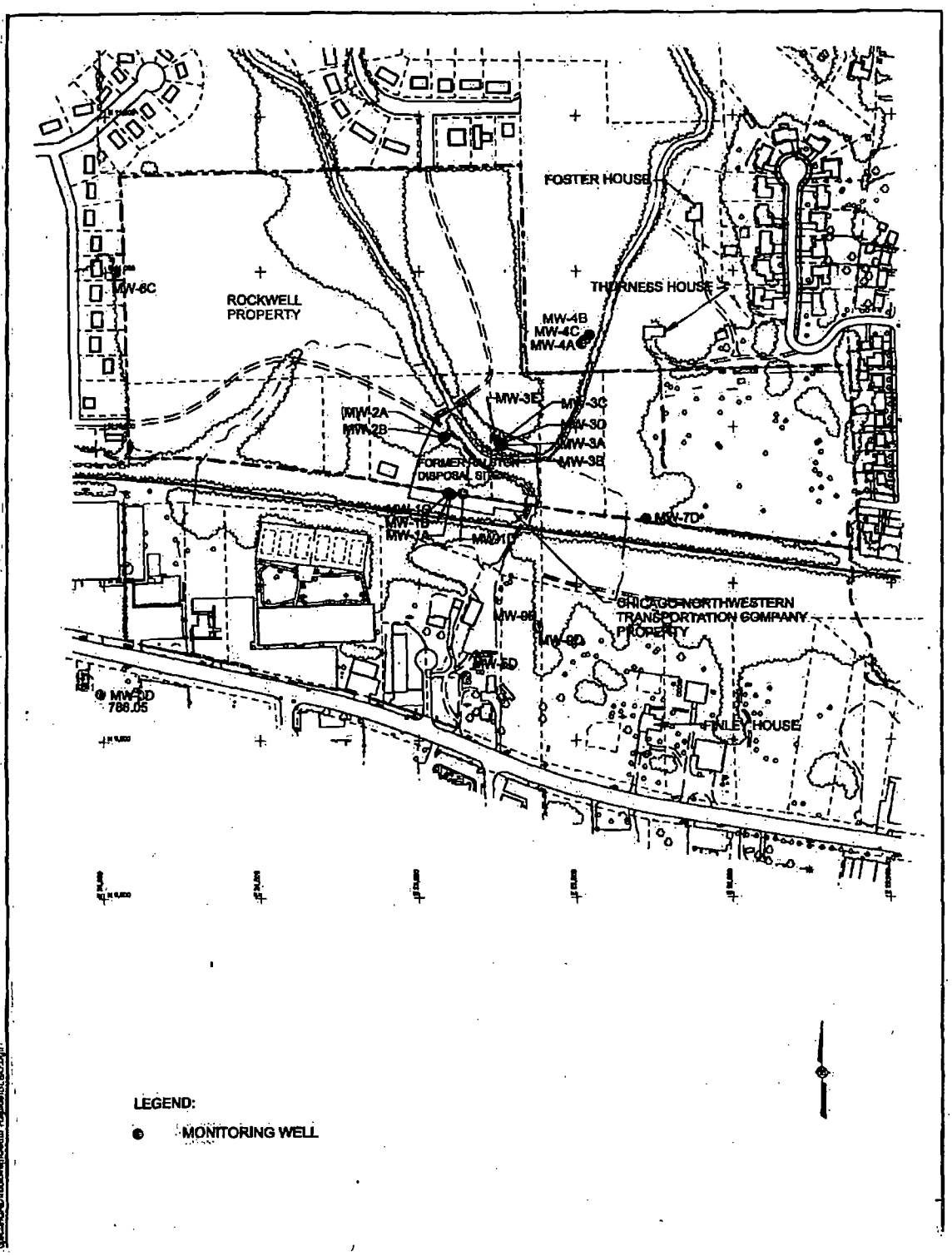
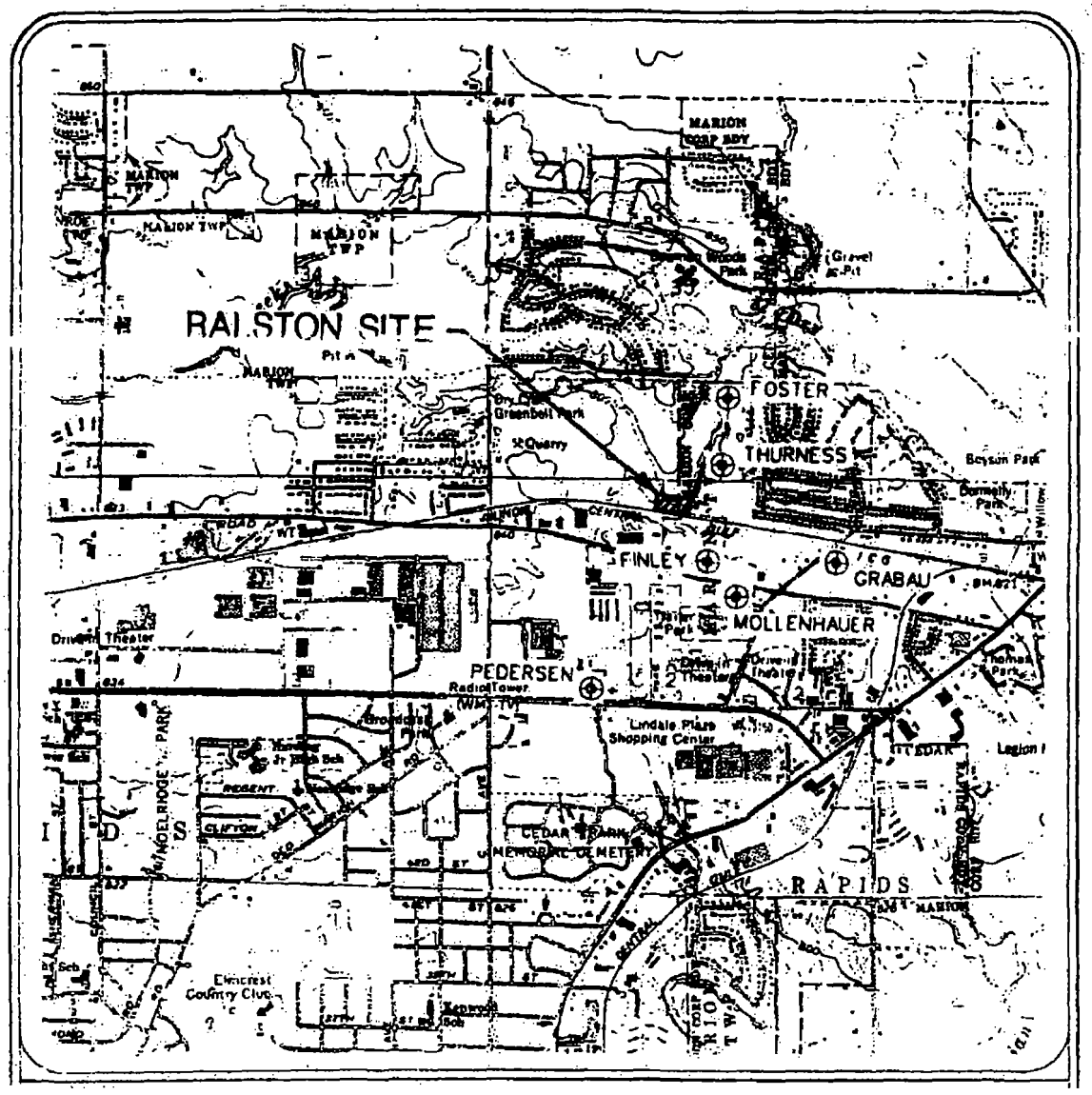


FIGURE 3
LOCATION OF PRIVATE WELLS



Attachments

ATTACHMENT A
O&M COSTS

2006-2010 Operation and Maintenance Costs
Former Ralston Disposal Site - Cedar Rapids, Iowa

Item	2006	2007	2008	2009	2010
1 - Monitoring	$20,950	$16,950	$21,250	$17,700	$22,650
2 - Equipment Repair/Replacement*	$0	$0	$3,374	$350	$0
3 - Cap Maintenance (mowing, fence/gate repair, reseeding)	$1,000	$3,100	$6,100	$3,400	$3,600
4 - Reporting	$6,150	$5,950	$6,150	$6,050	$6,150
TOTAL	$28,100	$26,000	$36,874	$27,500	$32,400

Notes
* 2008: replacement of MW-8D completion, and MW-1 nest and DPE vault repairs; 2009: resurvey MW-8D completion.

Attachment B
Site Documents Reviewed

2006 Annual Remedial Action Activity Report, Former Ralston Disposal Site, MWH, January 2007.

2007 Annual Remedial Action Activity Report, Former Ralston Disposal Site, MWH, December 2007.

2008 Annual Remedial Action Activity Report, Former Ralston Disposal Site, MWH, February 2009.

2009 Annual Remedial Action Activity Report, Former Ralston Disposal Site, MWH, February 2010.

2010 Annual Remedial Action Activity Report, Former Ralston Disposal Site, MWH, March 2011.

Feasibility Study Report, Former Ralston Disposal Site, Cedar Rapids, Iowa, Montgomery Watson, August 1998.

Final Baseline Risk Assessment for the Ralston Disposal Site, Cedar Rapids, Iowa, CDM Federal Programs Corporation, October 21, 1994.

First Superfund Five-Year Review, Ralston Site, Cedar Rapids, Iowa, IDNR, May 18, 2006.

Letter to Robert Drustrup, IDNR, Re: Baseline Groundwater Sampling Event-Metals Results, MWH, July 6, 2001.

Memorandum: Comments on Ralston 5 Year Review, EPA, March, 24, 2011.

Memorandum: Five-Year Review Technical Assessment, Former Ralston Site, Cedar Rapids, Iowa, EPA, March 29, 2011.

Record of Decision, Ralston Site, Cedar Rapids, Iowa, EPA, September 1999.

Remedial Action Implementation Work Plan, Former Ralston Disposal Site, Cedar Rapids, Iowa, Montgomery Watson, September 2000.

Remedial Investigation Report, Former Ralston Disposal Site, Cedar Rapids, Iowa, Montgomery Watson, September 1997.

ATTACHMENT C
GROUNDWATER MONITORING DATA

TABLE 4-4

HISTORICAL GROUNDWATER ANALYTICAL RESULTS - VOLATILE ORGANIC COMPOUNDS
(Results in µg/L)
ROCKWELL COLLINS, INC., FORMER RALSTON DISPOSAL SITE - CEDAR RAPIDS, IOWA

Well No.	Sample Date	Tetrachloroethene	Trichloroethene	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	1,1-Dichloroethene	Vinyl Chloride	Benzene	Other VOC Detections
MW-1A	07-92	5	180	170	2	1, J	<2	<2	
	02-93	2, J	120	190	2, J	<10	<10	<10	
	12-93	-	-	-	-	-	-	-	
	08-94	-	-	-	-	-	-	-	
	12-94	1.9	87.5	144	1.8	<1	<2	<1	
	06-95	1.3	16.8	11	<1	<1	<2	<1	
	09-95	2.0	34.7	42.8	<1	<1	<2	<1	
	12-95	2.3	56.7	84.4	1.7	<1	<2	<1	
	03-96	1.8	70.8	128	2.7	<1	<2	<1	
	06-96	2.3	28.4	15.1	<1	<1	<2	<1	
	09-96	2.6	33.9	20.4	<1	<1	<2	<1	
	04-01	1.0	7.4	2.1	<1.0	<2.0	<1.0	<0.5	
	10-01	1.3	12.1	4.3	<1.0	<2.0	<1.0	<0.5	
	05-02	1.1	10.1	5.1	<1.0	<2.0	<1.0	<0.5	
	10-02	1.2	9.3	5.4	<1.0	<2.0	<1.0	<0.5	
	04-03	2.3	29.3	10.3	<1.0	<2.0	<1.0	<0.5	
	10-03	2.13	20.3	7.13	<1.0	<2.0	<1.0	<0.5	
	04-04	1.06	9.11	3.13	<1.0	<2.0	<1.0	<0.5	
	10-04	1.07	11.2	3.87	<1.0	<2.0	<1.0	<0.5	
	04-05	1.10	10.0	2.80	<1.0	<2.0	<1.0	<0.5	
	10-05	2.13	19.6	6.06	<1.0	<2.0	<1.0	<0.5	
	04-06	1.20	11.0	4.71	<1.0	<2.0	<1.0	<0.5	
	04-07	1.59	17.2	20.5	<1.0	<2.0	1.75	<0.5	
	04-08	1.33	8.20	3.71	<1.0	<2.0	<1.0	<0.500	
	04-09	1.17	4.54	1.08	<1.0	<2.0	<1.0	<0.500	
	05-10*	<1.00/<1.00	2.34/2.15	<1.00/<1.00	<1.00 C/<1.00	<2.00/<10.0	<1.00<1.00	<0.500/<0.500	
MW-1B	07-92	7	250	860	9	2	7	1	
	02-93	<100	230	1,400	12, J	<100	<100	<100	
	12-93	-	-	-	-	-	-	-	
	08-94	2	60	380	3	3	<20	<2	
	12-94	5.5	115	703	5.2	1.4	<2	<1	
	06-95	3.0	27.7	35.1	<1	<1	<2	<1	
	09-95	5.1	55.4	110	1.0	<1	<2	<1	
	12-95	6.5	81.4	175	2.4	<1	<2	<1	
	03-96	4.0	47.4	46.5	<2	<2	<2	<2	
	03-96	4.0	47.4	46.5	<2	<2	<2	<2	
	06-96	4.3	41.1	23.4	<1	<1	<2	<1	
	09-96	5.8	56.8	40.9	<1	<1	<2	<1	
	04-01	1.7	11.9	6.2	<1.0	<2.0	<1.0	<0.5	

TABLE 4-4 (CONTINUED)

HISTORICAL GROUNDWATER ANALYTICAL RESULTS - VOLATILE ORGANIC COMPOUNDS
(Results in µg/L)
ROCKWELL COLLINS, INC., FORMER RALSTON DISPOSAL SITE - CEDAR RAPIDS, IOWA

Well No.	Sample Date	Tetrachloroethene	Trichloroethene	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	1,1-Dichloroethene	Vinyl Chloride	Benzene	Other VOC Detections
MW-1B (Continued)	10-01	2.0	20.3	25.7	<1.0	<2.0	<1.0	<0.5	
	05-02	3.7	35.4	53.9	<1.0	<2.0	<1.0	<0.5	
	10-02	2.6	21.6	21.4	<1.0	<2.0	<1.0	<0.5	
	04-03	5.2	67.2	56.7	<1.0	<2.0	<1.0	<0.5	
	10-03	4.98	49.0	46.7	<1.0	<2.0	<1.0	<0.5	
	04-04	1.93	15.8	12.0	<1.0	<2.0	<1.0	<0.5	
	10-04	3.71	34.7	34.2	<1.0	<2.0	<1.0	<0.5	
	04-05	3.45	34.1	47.9	<1.0	<2.0	<1.0	<0.5	
	10-05	5.25	48.4	56.9	<1.0	<2.0	<1.0	<0.5	
	04-06*	5.22/5.46	47.8/51.5	74.4/78.8	<1.0/<1.0	<2.0/<2.0	<1.0/<1.0	<0.5/<0.5	
	04-07	3.30	28.2	72.0, M1	<1.0	<2.0	<1.0	<0.5	
	04-08*	2.10/2.27	12.4/12.1	32.1/32.2	<1.0/<1.0	<2.0/<2.0	<1.0/<1.0	<0.500/<0.500	
	04-09	3.08	15.2	18.3	<1.0	<2.0	<1.0	<0.5	
	05-10	1.10	5.92	1.70	<1.00 C	<2.00	<1.00	<0.500	
MW-1C	07-92	0.6, J	65	43	0.5	2	<4	<4	
	02-93	<10	45	120	1	2	4, J	140	
	12-93	-	-	-	-	-	-	-	
	08-94	0.4, J	74	160	1	2	<10	16	
	12-94	-	66.9	181	1.2	2.3	<2	10.7	
	06-95	<1	58.1	157	<1	2.5	<2	47.1	
	09-95	<1	85.4	229	<1	4.0	<2	1	
	12-95	<1	85.4	223	2.4	4.8	<2	1.1	
	03-96	<2	63.9	174	<2	2.6	<2	<2	
	06-96	<1	55.5	150	1.3	2.5	<2	<1	
	09-96	<1	59	160	1.6	2.7	<2	1.8	
	04-01	<1.0	67.5	248	9.4	3.5	<1.0	1.4	
	10-01	<1.0	62.7	261	1.7	3.2	<1.0	0.7	
	05-02	<1.0	65.6	249	1.9	3.7	<1.0	<0.5	
	10-02	<1.0	62.7	230	1.7	3.2	<1.0	0.7	
	04-03*	<1.0/<1.0	74.7/74.1	320/327	2.8/2.7	4.1/4.1	<1.0/<1.0	<0.5/<0.5	
	10-03	<1.0	66.0	287	2.19	4.05	<1.0	<0.5	
	04-04*	<1.0/<1.0	62.5/63.2	292/280	2.45/2.19	3.85/3.57	<1.00/<1.00	1.07/1.09	
	10-04	<1.0	65.2	307	2.33	4.30	<1.0	<0.5	
	04-05	<1.0	59.4	269	1.75	3.60	<1.0	<0.5	
	10-05*	<1.0/<2	62.2/63	332/290**	3.03/290**	4.38/5	1.24/<2	<0.5/<2	
	04-06	<1.0	59.4	271	2.18	3.62	<1.00	<0.5	
	04-07	<1.0	53.2	299	3.32	3.48	<1.00	<0.5	
	04-08	<1.0	50.5	299	2.35	3.84	<1.0	<0.500	
	04-09	<1.0	49.4	232	1.54	3.19	<1.0	<0.5	
	05-10	<1.00	52.4	295	3.04	3.19	<1.00	<0.500	

TABLE 4-4 (CONTINUED)

HISTORICAL GROUNDWATER ANALYTICAL RESULTS - VOLATILE ORGANIC COMPOUNDS
(Results in µg/L)
ROCKWELL COLLINS, INC., FORMER RALSTON DISPOSAL SITE - CEDAR RAPIDS, IOWA

Well No.	Sample Date	Tetrachloroethene	Trichloroethene	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	1,1-Dichloroethene	Vinyl Chloride	Benzene	Other VOC Detections
MW-1D	07-92	-	-	-	-	-	-	-	
	02-93	<4	29	61	0.7, J	0.9, J	2, J	<4	
	12-93	0.5, J	35	130	2	1, J	<2	0.3, J	
	08-94	0.2, J	31	90	1	0.8, J	0.4	<2	
	12-94	<1	13.2	28.1	<1	<1	<1	<1	
	06-95	<1	21.9	47.9	<1	<1	<2	<1	
	09-95	<1	14.8	36.9	<1	<1	<2	<1	
	12-95	<1	8.3	18.4	<1	<1	<2	<1	
	03-96	<1	5.7	8.3	<1	<1	<2	<1	
	06-96	<1	3.6	7.0	<1	<1	<2	<1	
	09-96	<1	7.2	14.5	<1	<1	<2	<1	
	04-01	<1.0	9.4	30.6	<1.0	<2.0	<1.0	<0.5	
	10-01	<1.0	10.0	42.5	<1.0	<2.0	<1.0	<0.5	
	05-02	<1.0	3.6	9.2	<1.0	<2.0	<1.0	<0.5	
	10-02	<1.0	10.9	41.3	<1.0	<2.0	<1.0	<0.5	
	04-03	<1.0	2.6	7.2	<1.0	<2.0	<1.0	<0.5	
	10-03	<1.0	3.60	11.7	<1.0	<2.0	<1.0	<0.5	
	04-04	<1.0	11.1	63.4	<1.0	<2.0	<1.0	<0.5	
	10-04	<1.0	11.7	52.3	<1.0	<2.0	<1.0	<0.5	
	04-05*	<1.0/<1.0	3.83/3.72	13.0/13.2	<1.0/<1.0	<2.0/<2.0	<1.0/<1.0	<0.5/<0.5	
	10-05*	<1.0/<2	1.78/<2	4.94/6**	<1.0/6**	<2.0/<2	<1.0/<2	<0.5/<2	
	04-06	<1.0	<1.0	1.80	<1.0	<2.0	<1.0	<0.5	
	04-07	<1.0	3.76	21.2	<1.0	<2.0	<1.0	<0.5	
	04-08	<1.0	17.3	108, M1	<1.0	<2.0	<1.0	<0.500	
	04-09	<1.0	17.4	64.9	<1.0	<2.0	<1.0	<0.5	
	05-10	<1.00	15.3	55.4	<1.00 C	<2.00	<2.00	<0.500	
MW-2A	07-92	<10	37	110	2, J	1, J	7, J	<10	
	02-93	2, J	36	88	1, J	<10	5, J	<10	
	12-93	-	-	-	-	-	-	-	
	08-94	-	-	-	-	-	-	-	
	12-94	<1	15.2	41.1	<1	<1	<2	<1	
	06-95	<1	14.8	52.7	<1	<1	3.0	<1	
	09-95	<1	29.8	132	<1	<1	4.9	<1	
	12-95	<1	24.2	65.5	<1	<1	<2	<1	
	03-96	<1	19.6	40.8	<1	<1	<2	<1	
	06-96	<1	17.4	33.0	<1	<1	<2	<1	
	09-96	<1	31.9	109	1.4	<1	2.9	<1	
	04-01	<1.0	1.5	1.8	<1.0	<2.0	<1.0	<0.5	

TABLE 4-4 (CONTINUED)

HISTORICAL GROUNDWATER ANALYTICAL RESULTS - VOLATILE ORGANIC COMPOUNDS
(Results in µg/L)
ROCKWELL COLLINS, INC., FORMER RALSTON DISPOSAL SITE - CEDAR RAPIDS, IOWA

Well No.	Sample Date	Tetrachloroethene	Trichloroethene	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	1,1-Dichloroethene	Vinyl Chloride	Benzene	Other VOC Detections
MW-2A (Continued)	10-01	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.5	
	05-02	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.5	
	10-02	<1.0	6	18	<1.0	<2.0	<1.0	<0.5	
	04-03	<1.0	5.8	3.7	<1.0	<2.0	<1.0	<0.5	
	10-03	<1.0	2.52	7.25	<1.0	<2.0	<1.0	<0.5	
	04-04	<1.0	1.26	2.88	<1.0	<2.0	<1.0	<0.5	
	10-04	<1.0	3.41	12.4	<1.0	<2.0	<1.0	<0.5	
	04-05	<1.0	1.29	<1.0	<1.0	<2.0	<1.0	<0.5	
	10-05	<1.0	5.35	28.6	<1.0	<2.0	<1.0	<0.5	
	04-06	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.5	
	04-07*	<1.0/<1.0	<1.0/<1.0	<1.0/<1.0	<1.0/<1.0	<2.0/<2.0	<1.0/<1.0	<0.5/<0.5	
	04-08	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.500	
	04-09	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.5	
	05-10*	<1.00/<1.00	<1.00/<1.00	<1.00/<1.00	<1.00 C/<1.00 C	<2.00/<2.00	<1.00/<1.00	<0.500/<0.500	
MW-2B	07-92	<1	<1	<1	<1	<1	420	<1	
	02-93	<1	<1	<1	<1	<1	620	<1	
	12-93	<1	<1	<1	<1	<1	-	<1	
	08-94	<1	<1	<1	<1	<1	200	<1	
	12-94	<1	<1	<1	<1	<1	362	<1	
	06-95	<1	<1	<1	<1	<1	179	<1	
	09-95	<1	<1	<1	<1	<1	290	<1	
	12-95	<1	<1	<1	<1	<1	769	<1	
	03-96	<1	<1	1.2	<1	<1	939	<1	
	06-96	<1	<1	1.1	<1	<1	786	<1	
	09-96	<1	<1	<1	<1	<1	572	<1	
	04-01	<1.0	<1.0	2.0	<1.0	<2.0	625	<0.5	
	10-01	<1.0	12.1	3.0	<1.0	<2.0	559	<0.5	1.2[a]
	05-02	<1.0	<1.0	5.0	<1.0	<2.0	1,480	<0.5	
	10-02	<1.0	<1.0	2	<1.0	<2.0	461	<0.5	
	04-03*	<1.0/<1.0	<1.0/<1.0	7.7/7.8	<1.0/<1.0	<2.0/<2.0	1,000/991	<0.5/<0.5	6.3[b]
	10-03	<1.0	<1.0	6.46	<1.0	<2.0	886	<0.5	4.87[b]
	04-04	<1.0	<1.0	5.00	<1.0	<2.0	601	<0.5	0.31[c]
	10-04*	<1.0/<1.0	<1.0/<1.0	5.53/5.32	<1.0/<1.0	<2.0/<2.0	633/523	<0.5/<0.5	
	04-05	<1.0	<1.0	5.24	<1.0	<2.0	971	<0.5	
	10-05	<1.0/<1.0	<1.0/<1.0	8.58/1.05	<1.0/<1.0	<2.0/<2.00	1,010/1,030	<0.5/<0.5	
	04-06	<1.0	<1.0	9.36	<1.0	<2.0	906	<0.5	
	04-07	<1.0	<1.0	5.30	<1.0	<2.0	662	<0.5	
	04-08	<1.0	<1.0	3.49	<1.0	<2.0	474	<0.500	
	04-09	<10.0	<10.0	<10.0	<10.0	<20.0	298	<5.0	
	05-10	<5.00	<5.00	<5.00	<5.00	<50.0	413	<2.50	

TABLE 4-4 (CONTINUED)

HISTORICAL GROUNDWATER ANALYTICAL RESULTS - VOLATILE ORGANIC COMPOUNDS
(Results in µg/L)
ROCKWELL COLLINS, INC., FORMER RALSTON DISPOSAL SITE - CEDAR RAPIDS, IOWA

Well No.	Sample Date	Tetrachloroethene	Trichloroethene	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	1,1-Dichloroethene	Vinyl Chloride	Benzene	Other VOC Detections
MW-3A	07-92	6, J	3,900	11,000	32, J	260	1,500	7, J	
	02-93	<2,500	4,300	33,000	<2,500	440, J	8,900	<2,500	
	12-93	-	-	-	-	-	-	-	
	08-94	-	-	-	-	-	-	-	
	12-94	1.2	1,670	15,000	69.2	22.5	2,420	5.8	
	06-95	-	-	-	-	-	-	-	
	09-95	-	-	-	-	-	-	-	
	12-95	<5	883	7,760	41.2	95.2	1,330	<5	
	03-96	<50	1,180	6,190	<50	87.0	872	<50	
	07-96	<10	5,000	32,300	60.3	400.0	2,320	<10	
	09-96	<10	302	7,100	42.7	83.6	814	2	
	04-01	2.0	4,460	28,300	1,780	390	1,160	4.5	3.3[a]
	10-01	<1.0	561	15,100	<1.0	<2.0	<1.0	3.0	
	05-02*	<1.0/<500	1,690/2,200	23,500/21,000	75.0	167/<500	969/1,400	3.2/<500	7.4[a], 2.6[e]
	10-02	<1.0	475	18,500	88.3	211	1,230	3.6	3.9[a], 8.8[e]
	04-03	<1.0	70.6	14,800	168	<100	927	<0.5	5.3[a], 1.8[e], 1.1[f]
	10-03	<1.0	173	7,080	64.7	52.2	472	1.79	3.96[a]
	04-04	1.30	3,580	22,800	246	298	966	4.42	3.62[a], 8.33[e]
	10-04	<1.0	198	8,120	58.6	78.5	640	1.78	1.08[e]
	04-05	<1.0	125	6,720	44.0	44.2	518	0.96	2.81[a]
	10-05*	<1.0/<100	264/220	5,910/6,700**	65.3/6,700**	42.9/<100	472/420	1.21/<100	3.20[a]
	04-06	<1.0	19.2	3,860	15.1	26.0	298	<0.5	2.44[a]
	04-07	<1.0	1,520	20,400	261	164	898	2.48	4.04[a]
	04-08	<1.0	2,390	23,200	59.1	222	739	3.01	4.19[a]
	04-09*	<5.0/<1.0	3,090/2,990	22,600/20,400	28.7/111	118/228	856/807	14.9/3.23	
	05-10	<100	6,140	30,800	<100	321	1,100	<50.0	
MW-3B	07-92	0.8, J	2,200	4,600	14	240	2,100	25	
	02-93	<500	1,200	4,800	<500	200, J	1,800	62, J	
	12-93	-	-	-	-	-	-	-	
	08-94	<2	580	2,400	12	140	1,800	13	
	12-94	<1	493	3,200	17.3	134	1,480	12.1	
	06-95	<1	410	2,630	21.9	117	1,560	9.6	
	09-95	<1	331	3,040	28.2	121	1,850	9.1	
	12-95	<1	337	3,100	26.9	141	1,890	10.6	
	03-96	<20	422	2,930	<20	102	1,480	<20	
	07-96	<1	562	3,340	9.0	117	1,300	9.8	
	04-01	<1.0	442	4,320	45.0	143	1,450	9.9	
	10-01	1.3	269	3,900	<1.0	<2.0	<1.0	10.2	
	05-02	<1.0/<100	257/350	3,060/3,900	24.8	110/150	1,270/1,900	9.9/<100	

TABLE 4-4 (CONTINUED)

HISTORICAL GROUNDWATER ANALYTICAL RESULTS - VOLATILE ORGANIC COMPOUNDS
(Results in µg/L)
ROCKWELL COLLINS, INC., FORMER RALSTON DISPOSAL SITE - CEDAR RAPIDS, IOWA

Well No.	Sample Date	Tetrachloroethene	Trichloroethene	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	1,1-Dichloroethene	Vinyl Chloride	Benzene	Other VOC Detections
MW-3B (Continued)	10-02	<1.0	375	4,910	17.6	158	1,700	16.8	
	04-03	<1.0	348	5,880	75.1	157	2,490	16.8	
	10-03	<1.0	247	5,790	91.4	153	2,180	16.9	
	04-04	<1.0	332	5,050	46.1	142	1,830	14.1	
	10-04	<1.0	224	4,760	22.8	124	1,990	15.8	0.41[e]
	04-05	<1.0	223	4,700	18.7	109	2,070	12.3	
	10-05	<1.0	145	6,100	103	133	2,820	14.9	
	04-06	<1.0	344	6,100	26.0	193	1,980	19.0	
	04-07	<1.0	324	6,410	142	132	1,810	14.7	
	04-08	<1.0	320	5,490	14.7	142	1,770	15.0	
	04-09	<10.0	256	5,380	28.7	118	1,850	14.9	
	05-10	<20.0	275	6,640	<20.0	<200	2,510	17.2	
MW-3C	07-92	-	-	-	-	-	-	-	
	02-93	<2	0.7, J	8	<2	6, J	3	<2	
	12-93	-	-	-	-	-	-	-	
	08-94	<2	0.2, J	38,000	5	200, J	9,000	<2	
	12-94	<1	1.0	73,200	76.5	328	8,290	246	
	06-95	-	-	-	-	-	-	-	
	09-95	<1	1.2	204	2.1	2.6	202	<1	
	12-95	-	-	-	-	-	-	-	
	03-96	-	-	-	-	-	-	-	
	07-96	-	-	-	-	-	-	-	
	09-96	-	-	-	-	-	-	-	
	05-01	<1.0	<1.0	15,000	286	108	9,730	54.4	22.6[f], 3.4[e], 23.0[d], 3.4[d]
	10-01	<1.0	<1.0	37,200	119	242	6,950	79	
	05-02	<1.0	1.1	38,300	303	314	7,620	100	3.4[e], 66.4[f]
	10-02	<1.0	2.4	36,000	164	366	6,200	103	3[a], 3[d], 55.3[f]
	04-03	<1.0	1.0	40,100	429	430	7,360	113	1.5[e], 2.9[e], 54.4[f]
	04-04	<1.0	2.40	45,100	427	407	8,160	117	2.83[e], 1.92[g], 55.7[f]
	04-05	<1.0	1.00	48,700	201	352	9,430	119	2.52[e], 73.5
	10-05	<1.0	1.35	40,500	<100	347	7,100	120	2.89[e], 2.64[g], 62.8
	04-06	<1.0	1.12	41,800	396	451	7,610	137	1.63[e], 5.17[e], 73.8[f], 3.34[g]

TABLE 4-4 (CONTINUED)

HISTORICAL GROUNDWATER ANALYTICAL RESULTS - VOLATILE ORGANIC COMPOUNDS
(Results in µg/L)
ROCKWELL COLLINS, INC., FORMER RALSTON DISPOSAL SITE - CEDAR RAPIDS, IOWA

Well No.	Sample Date	Tetrachloroethene	Trichloroethene	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	1,1-Dichloroethene	Vinyl Chloride	Benzene	Other VOC Detections
MW-3C	04-07	<1.0	1.26	49,300	878	346	8,000	121	75.0[f], 1.94[g]
(Continued)	04-08	<1.0	<20.0	40,200	111	381	8,050	121	1.07[h], 76.7[f]
	04-09	<100	<100	28,400	<100	236	6,520	91.0	
	05-10	<200	<200	35,600	<200	<2,000	9,640	<100	
MW-3D	07-92	-	-	-	-	-	-	-	
	02-93	<50	58	500	<50	6, J	110	5, J	
	12-93	<2	7	33	0.4, J	0.4, J	2	<2	
	08-94	<2	3	15	0.4, J	0.4, J	7	<2	
	12-94	<1	2.2	11	<1	<1	2.6	<1	
	06-95	<1	2.1	6.4	<1	<1	<2	<1	
	09-95	<1	1.2	8.1	<1	<1	3.2	<1	
	12-95	<1	1.2	4.9	<1	<1	<2	<1	
	03-96	<1	1.1	3.2	<1	<1	<2	<1	
	07-96	<1	<1	<1	<1	<1	<2	<1	
	09-96	<1	<1	2.3	<1	<1	<2	<1	
	04-01	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.5	
	10-01	<1.0	<1.0	2.0	<1.0	<2.0	1.2	<0.5	
	05-02	<1.0	<1.0	1.2	<1.0	<2.0	<1.0	<0.5	
	10-02	<1.0	<1.0	1.2	<1.0	<2.0	<1.0	<0.5	
	04-03	<1.0	<1.0	1.13	<1.0	<2.0	<1.00	<0.5	
	10-03*	<1.0/<1.0	<1.0/<1.0	<1.0/<1.0	<1.0/<1.0	<2.0/<2.0	<1.0/<1.0	<0.5/<0.5	
	04-04*	<1.0/<1.0	<1.0/<1.0	<1.0/<1.0	<1.0/<1.0	<2.0/<2.0	<1.0/<1.0	<0.5/<0.5	
	10-04	<1.0	<1.0	1.20	<1.0	<2.0	<1.0	<0.5	
	04-05*	<1.0/<1.0	<1.0/<1.0	1.31/1.59	<1.0/<1.0	<2.0/<2.0	<1.0/<1.0	<0.5/<0.5	
	10-05	<1.0/<1.0	<1.0/<1.0	<1.0/1.05	<1.0/<1.0	<2.0/<2.0	<1.00/<1.0	<0.5/<0.5	
	04-06*	<1.0/<1.0	<1.0/<1.0	<1.0/<1.0	<1.0/<1.0	<2.0/<2.0	<1.0/<1.0	<0.5/<0.5	
	04-07	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.5	
	04-08	<1.0	<1.0	1.11	<1.0	<2.0	<1.0	<0.500	
	04-09	<1.00	<1.00	1.64	<1.0	<2.0	<1.0	<0.500	
	05-10	<1.00	1.02	5.05	<1.00	<10.0 MIa	1.95	<0.500	
MW-3E	12-93	<2	0.2, J	1, J	<2	<2	<2	<2	
	08-94	<2	<2	<2	<2	<2	<2	<2	
	12-94	<1	<1	<1	<1	<1	<2	<1	
	06-95	<1	<1	<1	<1	<1	<2	<1	
	09-95	<1	<1	<1	<1	<1	<2	<1	
	12-95	<1	<1	<1	<1	<1	<2	<1	
	03-96	<1	<1	<1	<1	<1	<2	<1	

TABLE 4-4 (CONTINUED)

HISTORICAL GROUNDWATER ANALYTICAL RESULTS - VOLATILE ORGANIC COMPOUNDS
(Results in µg/L)
ROCKWELL COLLINS, INC., FORMER RALSTON DISPOSAL SITE - CEDAR RAPIDS, IOWA

Well No.	Sample Date	Tetrachloroethene	Trichloroethene	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	1,1-Dichloroethene	Vinyl Chloride	Benzene	Other VOC Detections
MW-3E	07-96	<1	<1	<1	<1	<1	<2	<1	
(Continued)	09-96	<1	<1	<1	<1	<1	<2	<1	
	04-01	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.5	1.1[a]
	10-01	<1.0	<1.0	1.9	<1.0	<2.0	<1.0	<0.5	
	05-02	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.5	
	10-02	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1	
	04-03	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.5	1.04[a]
	10-03	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.5	
	04-04	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.5	
	10-04*	<1.0/<1.0	<1.0/<1.0	<1.0/<1.0	<1.0/<1.0	<2.0/<2.0	<1.0/<1.0	<0.5/<0.5	
	04-05	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.5	
	10-05	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.5	
	04-06	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.5	
	04-07	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.5	
	04-08	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.500	
	04-09	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.500	
	05-10	<1.00	<1.00	<1.00	<5.00	<10.0	<1.00	<0.500	
MW-4A	07-92	-	-	-	-	-	-	-	
	02-93	<2	<2	2	<2	<2	1, J	<2	
	12-93	-	-	-	-	-	-	-	
	08-94	-	-	-	-	-	-	-	
	12-94	<1	<1	1.4	<1	<1	<2	<1	
	06-95	<1	<1	<1	<1	<1	<2	<1	
	09-95	<1	<1	3.2	<1	<1	<2	<1	
	12-95	<1	<1	3.7	<1	<1	2.2	<1	
	03-96	<1	<1	<1	<1	<1	<2	<1	
	07-96	<1	<1	1.2	<1	<1	<2	<1	
	09-96	<1	<1	2.4	<1	<1	<2	<1	
	04-01	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.5	
	10-01	<1.0	<1.0	3.0	<1.0	<2.0	2.4	<0.5	
	05-02	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.5	
	10-02	<1.0	<1.0	2.8	<1.0	<2.0	2.2	<0.5	
	04-03	<1.0	<1.0	1.2	<1.0	<2.0	<1.0	<0.5	
	10-03	<1.0	<1.0	3.27	<1.0	<2.0	1.93	<0.5	
	04-04	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.5	
	10-04	<1.0	<1.0	3.43	<1.0	<2.0	1.64	<0.5	
	04-05	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.5	
	10-05	<1.0	<1.0	2.35	<1.0	<2.0	1.63	<0.5	
	04-06	<1.0	<1.0	<1.0	<1.0	<2.0	<2.0	<0.5	

TABLE 4-4 (CONTINUED)

HISTORICAL GROUNDWATER ANALYTICAL RESULTS - VOLATILE ORGANIC COMPOUNDS
(Results in µg/L)
ROCKWELL COLLINS, INC., FORMER RALSTON DISPOSAL SITE - CEDAR RAPIDS, IOWA

Well No.	Sample Date	Tetrachloroethene	Trichloroethene	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	1,1-Dichloroethene	Vinyl Chloride	Benzene	Other VOC Detections
MW-4A (Continued)	04-07	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.5	
	04-08	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.5	
	04-09	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.500	
	05-10	<1.00	<1.00	<1.00	<1.00	<10.0	<1.0	<0.500	
MW-4B	07-92	-	-	-	-	-	-	-	
	02-93	<2	<2	0.3, J	<2	<2	0.7, J	<2	
	12-93	-	-	-	-	-	-	-	
	08-94	<2	<2	<2	<2	<2	<2	<2	
	12-94	<1	<1	<1	<1	<1	<2	<1	
	06-95	<1	<1	<1	<1	<1	<2	<1	
	09-95	<1	<1	<1	<1	<1	<2	<1	
	12-95	<1	<1	<1	<1	<1	<2	<1	
	03-96	<1	<1	<1	<1	<1	<2	<1	
	07-96	<1	<1	<1	<1	<1	<2	<1	
	09-96	<1	<1	<1	<1	<1	<2	<1	
	04-01	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.5	
	10-01	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.5	
	05-02	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.5	
	10-02	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.5	
	04-03	<1.0	<1.0	<1.0	<1.0	<2.0	2.5	<0.5	
	10-03	<1.0	<1.0	<1.0	<1.0	<2.0	1.21	<0.5	
	04-04	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.5	
	10-04	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.5	
	04-05	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.5	
	10-05	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.5	
	04-06	<1.0	<1.0	<1.0	<1.0	<2.0	1.50	<0.5	
	04-07	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.5	
	04-08	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.5	
	04-09	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.500	
	05-10	<1.0	<1.00	<1.00	<1.00	<10.0	<1.00	<0.500	
MW-4C	07-92	-	-	-	-	-	-	-	
	02-93	<2	0.6, J	1, J	<2	<2	<2	<2	
	12-93	<2	0.4, J	1, J	<2	<2	<2	<2	
	08-94	<2	0.4, J	1, J	<2	<2	<2	<2	
	12-94	<1	<1	<1	<1	<1	<2	<1	
	06-95	<1	<1	<1	<1	<1	<1	<1	
	09-95	<1	<1	<1	<1	<1	<1	<1	
	12-95	<1	<1	<1	<1	<1	<2	<1	

TABLE 4-4 (CONTINUED)

HISTORICAL GROUNDWATER ANALYTICAL RESULTS - VOLATILE ORGANIC COMPOUNDS
(Results in µg/L)
ROCKWELL COLLINS, INC., FORMER RALSTON DISPOSAL SITE - CEDAR RAPIDS, IOWA

Well No.	Sample Date	Tetrachloroethene	Trichloroethene	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	1,1-Dichloroethene	Vinyl Chloride	Benzene	Other VOC Detections
MW-4C (Continued)	03-96	<1	<1	<1	<1	<1	<2	<1	
	07-96	<1	<1	<1	<1	<1	<2	<1	
	09-96	<1	<1	<1	<1	<1	<2	<1	
	04-01	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.5	
	10-01	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.5	
	05-02	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.5	
	10-02	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.5	2[a]
	04-03	<1.0	<1.0	1.1	<1.0	<2.0	<1.0	<0.5	
	10-03	<1.0	<1.0	1.02	<1.0	<2.0	<1.0	<0.5	
	04-04	<1.0	<1.0	1.48	<1.0	<2.0	<1.0	<0.5	
	10-04	<1.0	<1.0	1.85	<1.0	<2.0	<1.0	<0.5	
	04-05	<1.0	<1.0	1.36	<1.0	<2.0	<1.0	<0.5	
	10-05	<1.0	<1.0	1.28	<1.0	<2.0	<1.0	<0.5	
	04-06	<1.0	<1.0	1.70	<1.0	<2.0	<1.0	<0.5	
	04-07	<1.0	<1.0	1.11	<1.0	<2.0	<1.0	<0.5	
	04-08	<1.0	<1.0	1.00	<1.0	<2.0	<1.0	<0.500	
	04-09	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.500	
	05-10	<1.00	<1.00	<1.00	<1.00	<10.0	<1.00	<0.500	
MW-5D	12-93	<2	<2	<2	<2	<2	<2	<2	
	08-94	<2	<2	<2	<2	<2	<2	<2	
	12-94	<1	<1	<1	<1	<1	<2	<1	
	06-95	<1	<1	<1	<1	<1	<1	<1	
	09-95	<1	<1	<1	<1	<1	<1	<1	
	12-95	<1	<1	<1	<1	<1	<2	<1	
	03-96	<1	<1	<1	<1	<1	<2	<1	
	07-96	<1	<1	<1	<1	<1	<2	<1	
	09-96	<1	<1	<1	<1	<1	<2	<1	
	04-01	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.5	
	10-01	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.5	
	04-02	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.5	
	10-02	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.5	
	04-03	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.5	
	10-03	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.5	
	04-04	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.5	
	10-04	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.5	
	04-05	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.5	
	10-05	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.5	
	04-06	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.5	
	04-07	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.5	

TABLE 4-4

HISTORICAL GROUNDWATER ANALYTICAL RESULTS - VOLATILE ORGANIC COMPOUNDS
(Results in µg/L)
ROCKWELL COLLINS, INC., FORMER RALSTON DISPOSAL SITE - CEDAR RAPIDS, IOWA

Well No.	Sample Date	Tetrachloroethene	Trichloroethene	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	1,1-Dichloroethene	Vinyl Chloride	Benzene	Other VOC Detections
MW-1A	07-92	5	180	170	2	1, J	<2	<2	
	02-93	2, J	120	190	2, J	<10	<10	<10	
	12-93	-	-	-	-	-	-	-	
	08-94	-	-	-	-	-	-	-	
	12-94	1.9	87.5	144	1.8	<1	<2	<1	
	06-95	1.3	16.8	11	<1	<1	<2	<1	
	09-95	2.0	34.7	42.6	<1	<1	<2	<1	
	12-95	2.3	56.7	84.4	1.7	<1	<2	<1	
	03-96	1.8	70.8	128	2.7	<1	<2	<1	
	06-96	2.3	28.4	15.1	<1	<1	<2	<1	
	09-96	2.6	33.9	20.4	<1	<1	<2	<1	
	04-01	1.0	7.4	2.1	<1.0	<2.0	<1.0	<0.5	
	10-01	1.3	12.1	4.3	<1.0	<2.0	<1.0	<0.5	
	05-02	1.1	10.1	5.1	<1.0	<2.0	<1.0	<0.5	
	10-02	1.2	9.3	5.4	<1.0	<2.0	<1.0	<0.5	
	04-03	2.3	29.3	10.3	<1.0	<2.0	<1.0	<0.5	
	10-03	2.13	20.3	7.13	<1.0	<2.0	<1.0	<0.5	
	04-04	1.06	9.11	3.13	<1.0	<2.0	<1.0	<0.5	
	10-04	1.07	11.2	3.87	<1.0	<2.0	<1.0	<0.5	
	04-05	1.10	10.0	2.80	<1.0	<2.0	<1.0	<0.5	
	10-05	2.13	19.6	6.06	<1.0	<2.0	<1.0	<0.5	
	04-06	1.20	11.0	4.71	<1.0	<2.0	<1.0	<0.5	
	04-07	1.59	17.2	20.5	<1.0	<2.0	1.75	<0.5	
	04-08	1.33	8.20	3.71	<1.0	<2.0	<1.0	<0.500	
	04-09	1.17	4.54	1.08	<1.0	<2.0	<1.0	<0.500	
	05-10*	<1.00/<1.00	2.34/2.15	<1.00/<1.00	<1.00 C/<1.00	<2.00/<10.0	<1.00<1.00	<0.500/<0.500	
MW-1B	07-92	7	250	860	9	2	7	1	
	02-93	<100	230	1,400	12, J	<100	<100	<100	
	12-93	-	-	-	-	-	-	-	
	08-94	2	60	380	3	3	<20	<2	
	12-94	5.5	115	703	5.2	1.4	<2	<1	
	06-95	3.0	27.7	35.1	<1	<1	<2	<1	
	09-95	5.1	55.4	110	1.0	<1	<2	<1	
	12-95	6.5	81.4	175	2.4	<1	<2	<1	
	03-96	4.0	47.4	46.5	<2	<2	<2	<2	
	03-96	4.0	47.4	46.5	<2	<2	<2	<2	
	06-96	4.3	41.1	23.4	<1	<1	<2	<1	
	09-96	5.8	56.8	40.9	<1	<1	<2	<1	
	04-01	1.7	11.9	6.2	<1.0	<2.0	<1.0	<0.5	

TABLE 4-4 (CONTINUED)

HISTORICAL GROUNDWATER ANALYTICAL RESULTS - VOLATILE ORGANIC COMPOUNDS
(Results in µg/L)
ROCKWELL COLLINS, INC., FORMER RALSTON DISPOSAL SITE - CEDAR RAPIDS, IOWA

Well No.	Sample Date	Tetrachloroethene	Trichloroethene	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	1,1-Dichloroethene	Vinyl Chloride	Benzene	Other VOC Detections
MW-8D	10-02	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.5	
(Continued)	04-03	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.5	
	10-03*	<1.0/<1.0	<1.0/<1.0	<1.0/<1.0	<1.0/<1.0	<2.0/<2.0	<1.0/<1.0	<0.5/<0.5	
	04-04	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.5	
	10-04	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.5	
	04-05	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.5	
	10-05	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.5	
	04-06	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.5	
	04-07	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.5	
	04-08	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.5	
	04-09	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<0.5	
	05-10	<1.00	<1.00	<1.00	<1.00	<10.0	<1.00	<0.500	
MW-9B	08-94	<20	110	330	3,J	95	4, J	110	
	12-94	<1	3.6	153	<1	1.3	<2	<1	
	06-95	<1	5.5	371	2.7	4.8	3.2	<1	
	09-95	<1	1.6	52.6	<1	<1	<2	<1	
	12-95	<1	<1	31.9	<1	<1	<2	<1	
	03-96	<1	1.3	22.1	<1	<1	<2	<1	
	06-96	<1	4.2	39.0	<1	<1	<2	<1	
	09-96	<1	6.5	99.3	<1	1.1	<2	<1	
	06-96	<1	4.2	39.0	<1	<1	<2	<1	
	09-96	<1	6.5	99.3	<1	1.1	<2	<1	
	04-01	<1.0	5.8	500	5.8	4.8	4.6	<0.5	
	10-01	<1.0	3.4	381	1.3	2.8	<1.0	<0.5	
	04-02	<1.0	1.6	73.0	<1.0	<2.0	2.5	<0.5	
	10-02	<1.0	4.3	366	3.3	<2.0	2.4	<0.5	
	04-03	<1.0	<1.0	13.5	<1.0	<2.0	<1.0	<0.5	
	10-03	<1.0	3.17	229	2.00	3.21	17.0	<0.5	
	04-04	<1.0	4.90	648	4.08	6.23	8.26	<0.5	
	10-04	<1.0	1.89	225	1.69	2.35	<1.0	<0.5	
	04-05	<1.0	2.09	82.7	<1.0	<2.0	5.43	<0.5	
	10-05	<1.0	2.09	36.6	<1.0	<2.0	<1.0	<0.5	
	04-06	<1.0	1.21	19.1	<1.00	<2.0	3.88	<0.5	
	04-07*	<1.0/<1.0	4.84/4.83	981/874	7.97/9.96	9.14/8.29	10.4/10.0	<0.5/<0.5	
	04-08*	<1.0/<1.0	2.44/2.48	498/499	2.83/23.46	5.12/5.41	19.5/.19.2	<0.500/<0.500	
	04-09	<1.0/<1.0	1.59/1.58	233/241	1.02/<1.0	2.36/2.30	13.5/15.0	<0.500/<0.500	
	05-10	<5.00	<5.00	205	<5.00	<50.0	17.8	<2.50	
MW-9D	08-94	<2	5	12	<2	0.2, J	<2	<2	
	12-94	<1	4.2	11.1	<1	<1	<1	<1	

TABLE 4-4 (CONTINUED)

HISTORICAL GROUNDWATER ANALYTICAL RESULTS - VOLATILE ORGANIC COMPOUNDS
(Results in µg/L)
ROCKWELL COLLINS, INC., FORMER RALSTON DISPOSAL SITE - CEDAR RAPIDS, IOWA

Well No.	Sample Date	Tetrachloroethene	Trichloroethene	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	1,1-Dichloroethene	Vinyl Chloride	Benzene	Other VOC Detections
MW-9D (Continued)	06-95	<1	6.0	16.3	<1	<1	<1	<1	
	09-95	<1	5.2	17.8	<1	<1	<1	<1	
	12-95	<1	5.5	18.7	<1	<1	<1	<1	
	06-96	<1	5.9	14.8	<1	<1	<2	<1	
	09-96	<1	<1	13.2	<1	<1	<2	5.2	
	04-01	<1.0	4.3	14.2	<1.0	<2.0	<1.0	<0.5	
	10-01	<1.0	3.6	17.0	<1.0	<2.0	<1.0	<0.5	
	04-02	<1.0	5.3	19.5	<1.0	<2.0	<1.0	<0.5	
	10-02	<1.0	5.3	21	<1.0	<2.0	<1.0	<0.5	
	04-03	<1.0	5.0	20.3	<1.0	<2.0	<1.0	<0.5	
	10-03	<1.0	3.99	21.2	<1.0	<2.0	<1.0	<0.5	
	04-04	<1.0	5.09	32.3	<1.0	<2.0	<1.0	<0.5	
	10-04	<1.0	5.60	34.4	<1.0	<2.0	<1.0	<0.5	
	04-05	<1.0	4.50	23.2	<1.0	<2.0	<1.0	<0.5	
	10-05	<1.0	5.20	23.2	<1.0	<2.0	<1.0	<0.5	
	04-06	<1.0	3.04	11.4	<1.0	<2.0	<1.0	<0.5	
	04-07	<1.0	3.56	20.7	<1.0	<2.0	<1.0	<0.5	
	04-08	<1.0	4.17	29.1	<1.0	<2.0	<1.0	<0.5	
	04-09	<1.0	3.78	24.1	<1.0	<2.0	<1.0	<0.5	
	05-10	<1.00	4.40	33.1	<1.00	<10.0	<1.00	<0.500	
Groundwater Action Level		5	5	70	NE	7	2	5	

Notes:

J Analyte reported below detection limit and is an estimated value.
- Indicates sample was not collected.
* Duplicate sample collection designations are as follows:
  MW-1B, 04-06; blind duplicate sample collected from MW-1B, labeled as MW-1E (duplicate sample indicated second).
  MW-1C, 04-03; blind duplicate sample collected from MW-1C, labeled as MW-1E (duplicate sample indicated second).
  MW-1C, 04-04; blind duplicate sample collected from MW-1C, labeled as MW-2C (duplicate sample indicated second).
  MW-1C, 10-05; Iowa Department of Natural Resources (IDNR) split result.
  MW-1D, 04-05; blind duplicate sample collected from MW-1D, labeled as MW-1E (duplicate sample indicated second).
  MW-1D, 10-05; IDNR split sample result.
  MW-2B, 04-03; blind duplicate sample collected from MW-2B, labeled as MW-2C (duplicate sample indicated second).
  MW-2B, 10-04; blind duplicate sample collected from MW-2B, labeled as MW-2C (duplicate sample indicated second).
  MW-2B, 10-05; blind duplicate sample collected from MW-2B, labeled as MW-2C (duplicate sample indicated second).

TABLE 4-4 (CONTINUED)

HISTORICAL GROUNDWATER ANALYTICAL RESULTS - VOLATILE ORGANIC COMPOUNDS
(Results in µg/L)
ROCKWELL COLLINS, INC., FORMER RALSTON DISPOSAL SITE - CEDAR RAPIDS, IOWA

Notes (continued):

* Duplicate sample collection designations are as follows (continued):
MW-2A, 04-07; blind duplicate sample collected from MW-2A, labeled as MW-2C (duplicate sample indicated second).
MW-3A, 05-02; IDNR split sample result.
MW-3A, 10-05; IDNR split sample result.
MW-3B, 05-02; IDNR split sample result.
MW-3D, 10-03; blind duplicate sample collected from MW-3D, labeled as MW-2C (duplicate sample indicated second).
MW-3D, 04-04; blind duplicate sample collected from MW-3D, labeled as MW-1E (duplicate sample indicated second).
MW-3D, 04-05; blind duplicate sample collected from MW-3D, labeled as MW-2C (duplicate sample indicated second).
MW-3D, 10-05; blind duplicate sample collected from MW-3D, labeled as MW-1E (duplicate sample indicated second).
MW-3D, 04-06; blind duplicate sample collected from MW-3D, labeled as MW-2C (duplicate sample indicated second).
MW-3E, 10-04; blind duplicate sample collected from MW-3E, labeled as MW-1E (duplicate sample indicated second).
MW-8D, 10-03; blind duplicate sample collected from MW-8D, labeled as MW-1E (duplicate sample indicated second).
MW-9B, 04-07; blind duplicate sample collected from MW-9B, labeled as MW-1E (duplicate sample indicated second).
MW-1B, 04-08, blind duplicate sample collected from MW-1B, labeled as MW-2C (duplicate sample indicated second).
MW-9B, 04-08, blind duplicate sample collected from MW-9B, labeled as MW-1E (duplicate sample indicated second).
MW-3A, 04-09, blind duplicate sample collected from MW-3A, labeled as MW-2C (duplicate sample indicated second).
MW-9B, 04-09, blind duplicate sample collected from MW-9B, labeled as MW-1E (duplicate sample indicated second).
MW-1A; 05-10; blind duplicate sample collected from MW-1A; labeled as MW-1E (duplicate sample indicated second).
MW-2A; 05-10; blind duplicate sample collected from MW-2A; labeled as MW-2C (duplicate sample indicated second).

** Result is total 1,2-Dichloroethene (DCE).
a Carbon disulfide.
b Chloroethane.
c Carbon tetrachloride (LL).
d 1,2-Dichlorobenzene.
e 1,1-Dichloroethane (DCA).
f Toluene.
g 1,2-Dichloroethane (LL).
h Ethylbenzene.

NE = Groundwater Action Level not established (Record of Decision – September 1999).

ATTACHMENT D
THURNESS WELL MONITORING

TABLE 4-7

SUMMARY OF VOLATILE ORGANIC COMPOUND DETECTIONS IN THURNESS WELL ROCKWELL COLLINS, FORMER RALSTON DISPOSAL SITE - CEDAR RAPIDS, IOWA (Concentrations in µg/L)

Date Sampled	Trichloroethene	cis-1,2-Dichloroethene	Vinyl Chloride
February 1993	1,J	2	ND
December 1993	ND	ND	ND
August 1994	NS	NS	NS
December 1994	1.8	1.9	ND
June 1995	1.3	2	ND
September 1995	1.8	2.5	ND
December 1995	ND	ND	ND
March 1996	2	2.2	ND
June 1996	ND	ND	ND
September 1996	3.6	4.8	ND
October 1996	2.8	2	ND
January 1997	3.1	3.7	ND
April 1997	3.0	3.5	ND
July 1997	2.0	2.2	ND
October 1997	1.7	2.1	ND
January 1998	ND	ND	ND
April 1998	ND	ND	ND
July 1998	ND	ND	ND
April 1999	ND	ND	ND
November 1999	ND	ND	ND
April 2001	ND	ND	ND
October 2001	ND	ND	ND
April 2002	ND	ND	ND
May 2002[a]	ND	ND	1.0
October 2002	ND	ND	ND
April 2003	ND	ND	1.2
October 2003	ND	ND	ND
April 2004	ND	ND	ND
October 2004	ND	ND	ND
April 2005	ND	ND	ND
October 2005	ND	ND	1.1
October 2005[a]	ND	ND	ND
April 2006	ND	ND	ND
October 2006	ND	ND	ND
April 2007	ND	ND	ND
September 2007	ND	ND	ND
April 2008	ND	ND	ND
October 2008	ND	ND	ND
April 2009	ND	ND	ND
October 2009	ND	ND	ND
May 2010	ND	ND	ND
October 2010	ND	ND	ND

Notes:

J = Indicates analyte detected at estimated concentration.
ND = Analyte not detected above laboratory quantification limits.
NS = Well not sampled.
µg/L = Micrograms per liter.
[a] Iowa Department of Natural Resources split sample.

Attachment E
Site Inspection Checklist

I. SITE INFORMATION	
Site name: Ralston	**Date of inspection: 4-14-2011**
Location and Region: Cedar Rapids, IA	**EPA ID: IAD980632491**
Agency, office, or company leading the five-year review: EPA-Region 7	**Weather/temperature: 50°F, overcast**

Remedy Includes: (Check all that apply)

- ■ Landfill cover/containment
- ■ Access controls
- ■ Institutional controls
- ☐ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☐ Other _____
- ■ Monitored natural attenuation
- ☐ Groundwater containment
- ☐ Vertical barrier walls

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Tom Gentner-Rockwell Collins Dir. of Env., Safety & Health Ops. 4-14-2011
   Name Title Date
   Interviewed ■ at site ■ at office ☐ by phone Phone no. 319-295-5710
   Problems, suggestions; ☐ Report attached _____

2. **O&M staff** Steve Varsa-MWH Project Manager 4-14-2011
   Name Title Date
   Interviewed ■ at site ■ at office ☐ by phone Phone no. 515-253-0830
   Problems, suggestions; ☐ Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

   Agency Iowa Department of Natural Resources
   Contact Greg Fuhrmann 4-14-2011 515-242-5241
   Name Title Date Phone no.
   Problems; suggestions; ☐ Report attached Greg Furhmann was filling in for the site manager, Robert Drustrup

4. **Other interviews** (optional) ☐ Report attached. None

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
   - ☐ O&M manual — ☐ Readily available — ☐ Up to date — ☐ N/A
   - ☐ As-built drawings — ☐ Readily available — ☐ Up to date — ☐ N/A
   - ☐ Maintenance logs — ☐ Readily available — ☐ Up to date — ☐ N/A

   Remarks On-site documents were not reviewed during site inspection.

2. **Site-Specific Health and Safety Plan** — ☐ Readily available — ☐ Up to date — ☐ N/A
   - ☐ Contingency plan/emergency response plan — ☐ Readily available — ☐ Up to date — ☐ N/A

   Remarks On-site documents were not reviewed during site inspection.

3. **O&M and OSHA Training Records** — ☐ Readily available — ☐ Up to date — ■ N/A

   Remarks _____

4. **Permits and Service Agreements**
   - ☐ Air discharge permit — ☐ Readily available — ☐ Up to date — ■ N/A
   - ☐ Effluent discharge — ☐ Readily available — ☐ Up to date — ■ N/A
   - ☐ Waste disposal, POTW — ☐ Readily available — ☐ Up to date — ■ N/A
   - ☐ Other permits _____ — ☐ Readily available — ☐ Up to date — ■ N/A

   Remarks _____

5. **Gas Generation Records** — ☐ Readily available — ☐ Up to date — ■ N/A

   Remarks _____

6. **Settlement Monument Records** — ☐ Readily available — ☐ Up to date — ■ N/A

   Remarks _____

7. **Groundwater Monitoring Records** — ☐ Readily available — ☐ Up to date — ☐ N/A

   Remarks On-site documents were not reviewed during site inspection.

8. **Leachate Extraction Records** — ☐ Readily available — ☐ Up to date — ■ N/A

   Remarks _____

9. **Discharge Compliance Records**
   - ☐ Air — ☐ Readily available — ☐ Up to date — ■ N/A
   - ☐ Water (effluent) — ☐ Readily available — ☐ Up to date — ■ N/A

   Remarks _____

10. **Daily Access/Security Logs** — ☐ Readily available — ☐ Up to date — ■ N/A

    Remarks _____

IV. O&M COSTS

1. **O&M Organization**
   - ☐ State in-house ☐ Contractor for State
   - ■ PRP in-house ■ Contractor for PRP
   - ☐ Federal Facility in-house ☐ Contractor for Federal Facility
   - ☐ Other_____

2. **O&M Cost Records –O&M costs discussed in the Five-Year Review Report**
   - ■ Readily available ☐ Up to date
   - ☐ Funding mechanism/agreement in place
   - Original O&M cost estimate_____ ☐ Breakdown attached

3. **Unanticipated or Unusually High O&M Costs During Review Period**
   - Describe costs and reasons: None

V. ACCESS AND INSTITUTIONAL CONTROLS ■ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ■ Gates secured ☐ N/A
   - Remarks No damage

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ■ N/A
   - Remarks

C. Institutional Controls (ICs)

1. **Implementation and enforcement**
   - Site conditions imply ICs are properly implemented ■ Yes ☐ No ☐ N/A
   - Site conditions imply ICs are being fully enforced ■ Yes ☐ No ☐ N/A

   - Type of monitoring (*e.g.*, self-reporting, drive by) Self-reporting, state oversight
   - Frequency Annual
   - Responsible party/agency Rockwell Collins/ IDNR
   - Contact Tom Gentner-Rockwell Collins (Name)

   - Reporting is up-to-date ■ Yes ☐ No ☐ N/A
   - Reports are verified by the lead agency ■ Yes ☐ No ☐ N/A

   - Specific requirements in deed or decision documents have been met ■ Yes ☐ No ☐ N/A
   - Violations have been reported ☐ Yes ☐ No ■ N/A
   - Other problems or suggestions: ☐ Report attached

2. **Adequacy** ■ ICs are adequate ☐ ICs are inadequate ☐ N/A
   - Remarks Current ICs are adequate although a more enforceable environmental covenant should replace the state Registry listing for the site in the future.

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ■ No vandalism evident
Remarks_____

2. **Land use changes on site** ■ N/A
Remarks_____

3. **Land use changes off site** ■ N/A
Remarks_____

VI. GENERAL SITE CONDITIONS

A. Roads ■ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ■ Roads adequate ☐ N/A
Remarks_____

B. Other Site Conditions

Remarks None

VII. LANDFILL COVERS ☐ Applicable ☐ N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ■ Settlement not evident
Areal extent_____ Depth_____
Remarks_____

2. **Cracks** ☐ Location shown on site map ■ Cracking not evident
Lengths_____ Widths_____ Depths_____
Remarks_____

3. **Erosion** ☐ Location shown on site map ■ Erosion not evident
Areal extent_____ Depth_____
Remarks_____

4. **Holes** ☐ Location shown on site map ■ Holes not evident
Areal extent_____ Depth_____
Remarks_____

5. **Vegetative Cover** ■ Grass ■ Cover properly established ☐ No signs of stress
☐ Trees/Shrubs (indicate size and locations on a diagram)
Remarks_____

6. **Alternative Cover (armored rock, concrete, etc.)** ☐ N/A
Remarks Creek bank has cable-concrete mat

7. **Bulges** ☐ Location shown on site map ■ Bulges not evident
Areal extent_____ Height_____
Remarks_____

8. **Wet Areas/Water Damage** ■ Wet areas/water damage not evident
☐ Wet areas ☐ Location shown on site map Areal extent_____
☐ Ponding ☐ Location shown on site map Areal extent_____
☐ Seeps ☐ Location shown on site map Areal extent_____
☐ Soft subgrade ☐ Location shown on site map Areal extent_____
Remarks_____

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ■ No evidence of slope instability
Areal extent_____
Remarks Creek bank is only area with significant slope

B. Benches ☐ Applicable ■ N/A
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ☐ Location shown on site map ■ N/A or okay
Remarks_____

2. **Bench Breached** ☐ Location shown on site map ■ N/A or okay
Remarks_____

3. **Bench Overtopped** ☐ Location shown on site map ■ N/A or okay
Remarks_____

C. Letdown Channels ☐ Applicable ■ N/A
(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** ☐ Location shown on site map ☐ No evidence of settlement
Areal extent_____ Depth_____
Remarks_____

2. **Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation
Material type_____ Areal extent_____
Remarks_____

3. **Erosion** ☐ Location shown on site map ☐ No evidence of erosion
Areal extent_____ Depth_____
Remarks_____

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ ☐ No obstructions
☐ Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
☐ No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations ■ Applicable ☐ N/A

1. **Gas Vents** ☐ Active ☐ Passive
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance
■ N/A
Remarks_____

2. **Gas Monitoring Probes**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ■ N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks Landfill cover is penetrated by former DVE wells that are no longer used. They appear to be in good condition.

4. **Leachate Extraction Wells**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ■ N/A
Remarks_____

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ■ N/A
Remarks_____